ENGINEERING AND MINING JOURNAL

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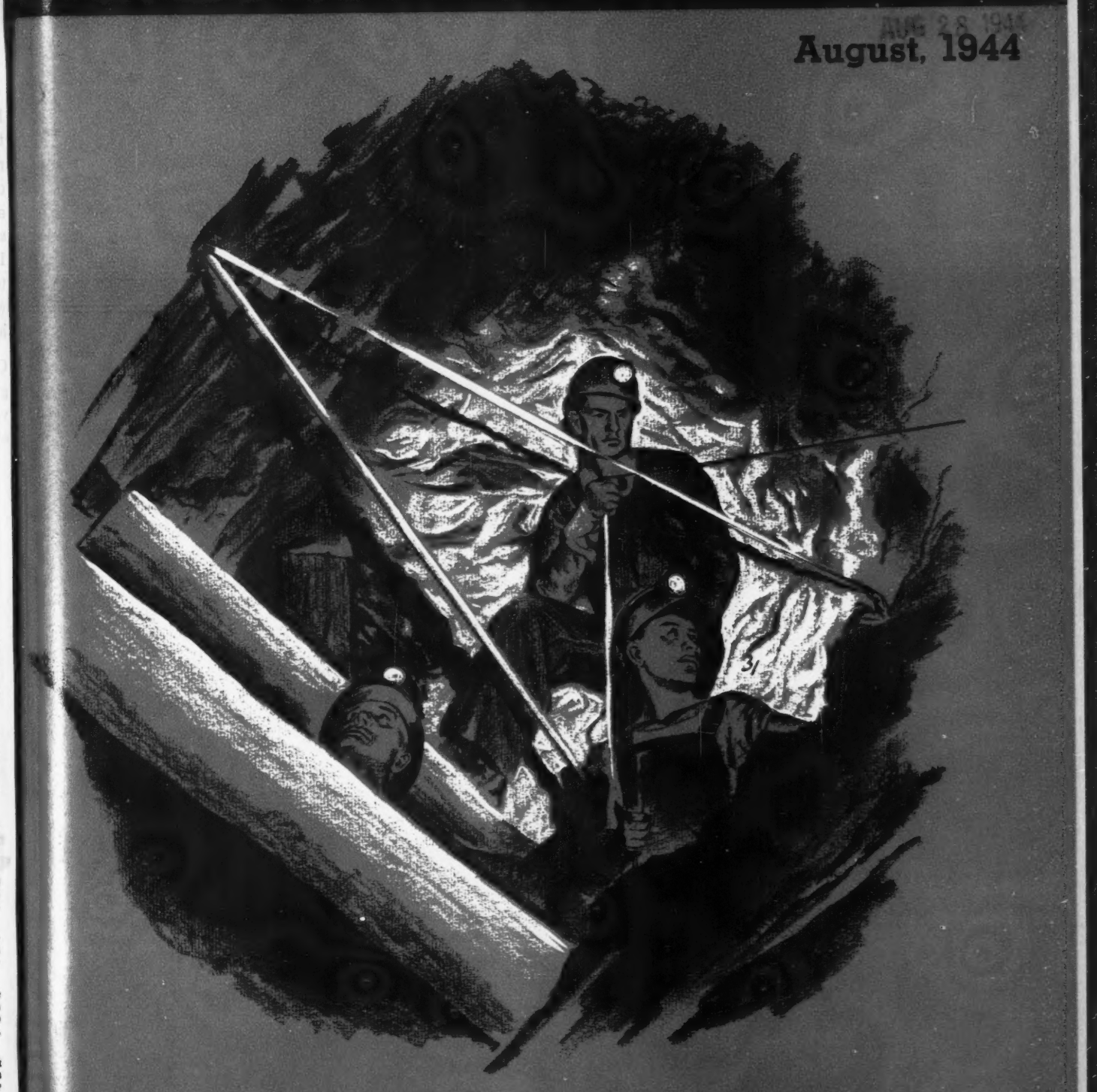
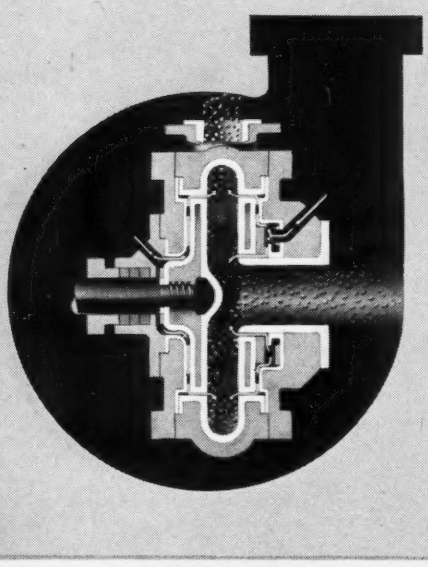


Magnesium From Carlsbad

"The Fountain of Perpetual Youth" in Abrasive Pumping



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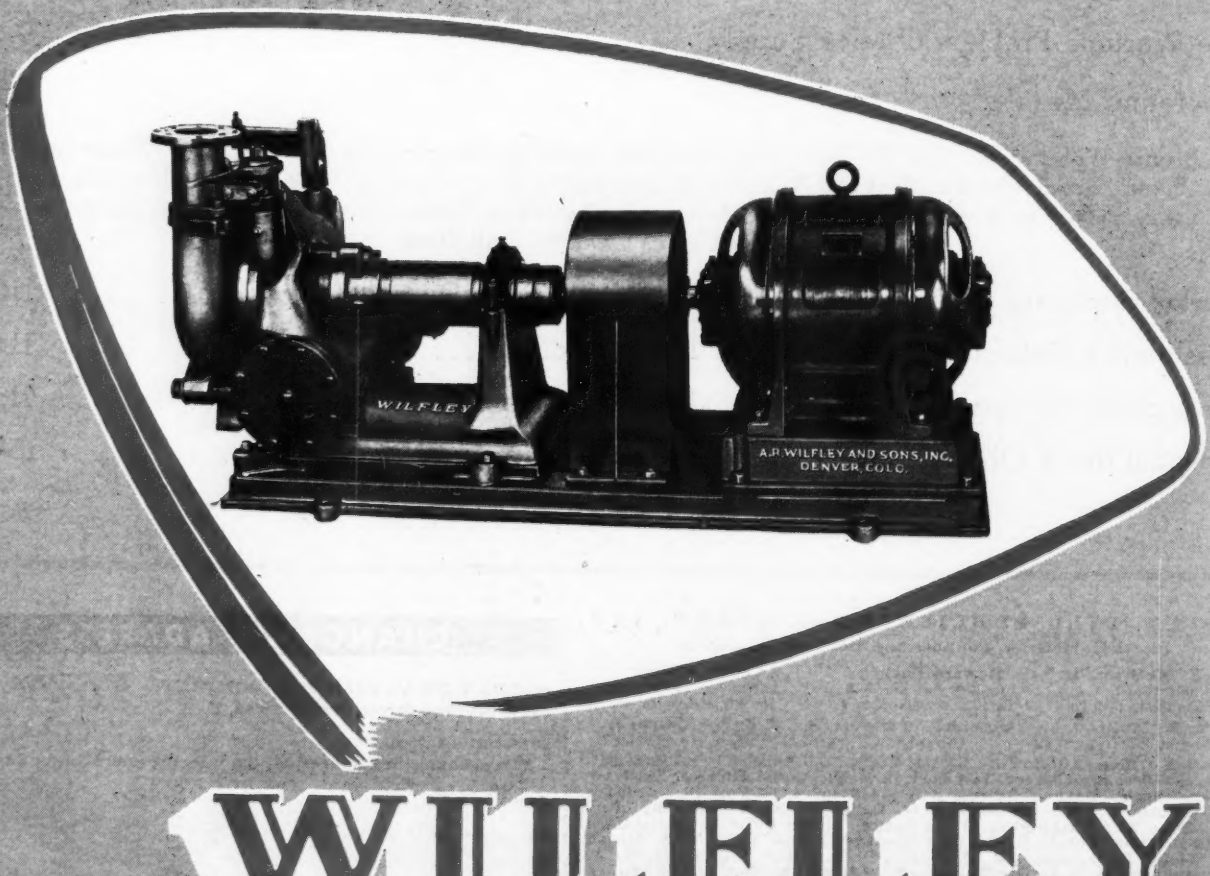

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ENGINEERING AND MINING JOURNAL

Evan Just, Editor

Stockpile Issue Needs Attention

THE REPORT of the surplus war property subcommittee of the Senate Committee on Small Business, released July 28, is somewhat ambiguous as to government dumping and mineral stockpiling. Therefore, we have printed in full those sections of the report dealing with these subjects (p. 103), so that our readers will not be misled by an abbreviated description.

The subcommittee's attitude is fairly well summarized in the following quotations.

"Where the Government's inventory of a particular product exceeds the capacity of a free market to absorb without undue dislocation, the Administrator should, with the advice of an industry advisory committee, provide for periodic sales so as to permit the industry to gage the market and make the necessary accommodations . . .

"After establishing stockpiles for security reasons in accordance with the recommendations of the military, the Administrator should, according to this view, work out with a mining industry advisory committee a program for the periodic sales of metal surpluses that will permit metal producers to gage the market and continue fair production of new metal without interruption."

The affected citizen immediately begins to wonder what is meant by "undue dislocation," "make the necessary accommodations," and "fair production." This report does not clearly state that the sale of surplus government minerals should be prevented from weighing heavily on the mining industry.

Aside from the question of purely military needs, admittedly the mining industry has no right to ask that public funds be kept tied up in mineral stockpiles permanently, simply to protect its markets. However, it does seem fair to demand that surpluses sold be restricted to 10 percent of the total market for each mineral when prices are low or unemployment becomes troublesome, and held to a maximum of 25 percent at any time.

This incident points up two circumstances connected with the subject of mineral stockpiling. First, in advocating stockpiling the industry has so stressed the military side that the need for protection of its markets against dumping has not been sufficiently impressed on Congress. Second, the total effort made by the industry toward securing stockpiling legislation has not been strong enough.

Unless you are willing to let this subject so vital to your interests become part of a dubious and ambiguous executive policy, WRITE YOUR SENATORS AND CONGRESSMAN!

Currency Stabilization Powers Should Be Limited

THE INTERNATIONAL MONETARY CONFERENCE has met and adjourned after agreeing on a stabilization plan and a plan for an international credit bank. Both schemes will now be submitted to the various governments for approval (p. 105).

Few people will disagree that international cooperation to prevent competitive devaluation, exchange speculation, blocked exchanges, exclusive barter agreements, and other impediments to multilateral international trade is a desirable thing.

However, these objectives demand nothing but the mutual exercise of common sense; no funds are required. Those exchange fluctuations whose stabilization requires financing can be divided into two categories, the short-term artificial, temporary, and "wildcat" swings, and the long-term "fundamental" swings. The former are caused by speculation, or temporary or seasonal variations in supply and demand of exchange. They are comparable to short swings in the stock market. The long-term fluctuations are caused by changes in a country's economic health, manipulations of currency to stabilize internal conditions, or forcing of a country's trade into artificial channels such as was practiced by Germany before the war.

The stabilization funds in use by this country and others for several years have been operated successfully to control the short-term swings, and there will be little objection to international cooperation toward the same end. The doubt and danger lie

entirely in the use of stabilization powers and funds to interfere with the longer term "fundamental" fluctuations.

It is evident at the outset that several if not all of the nations which participated in the recent international conference intend to use heroic measures if necessary to protect their domestic economies, living standards, and trade positions. The United Kingdom, for example, is ready to regiment its industries and refuses to consider restoring gold on this account. Because of impoverishment and dislocation almost every nation will want to indulge in some measures to control its economy.

We ask, "Why shouldn't the long-term problems be left to the normal movement of gold, where smooth operation simply demands that nations must keep their houses in order over the long term or suffer painful consequences?" The same principles that govern sound banking on Main St. must apply to international relationships. If a nation's currency requires support, what guarantees can be demanded comparable to the security required in ordinary banking? The international organization forswears the use of compulsion to make a nation discipline itself in case the "shot in the arm" from the fund fails to correct the defective situation. How then is the fund to protect itself in case a nation whose currency remains weak internationally refuses to reduce its production costs or otherwise make its goods more acceptable in international markets? What is to prevent nations from using the fund to the limit and then, instead of trying to be good, using their debit position as a club over the fund, just as some individual and corporate "dead beats" have done?

Gold is considered objectionable primarily because it reacts to the disadvantage of nations who want to "play horse" with sound economics. We believe that the use of stabilization funds and powers to afford relief from the duress which gold applies to economically unsound situations is a move into very dangerous ground.

In short, we hold that the international stabilization organization should restrict itself to ironing out the short-term swings and to persuading nations toward constructive solutions of their economic problems. The international organization should strive to bring about the earliest possible restoration of gold to universal use. If Congress accepts the stabilization proposal it should impose definite restraints on the power to use the fund as a "sucker" for nations who want to live on Park Avenue without shouldering the cost.

A Seven Year Grudge

AT A RECENT MEETING with a well known labor authority, Dr. Geo. W. Taylor, Vice Chairman of the War Labor Board, he related a story which is worth passing on.

He was engaged as impartial umpire to settle a dispute where violence had broken out in violation of contract. One of the culprits, who had heaved a brick through a window of the plant, impressed Taylor as an unusually docile, civilized fellow, "a regular Casper Milquetoast." Taylor became interested in finding out what prompted such an individual to be among a small minority which had resorted to violence. The amazing answer was that *seven years previously* this man's pay had been docked to the extent of $35.00 for some reason or other, to his mind, unfairly. For seven years he had nursed the grievance in his heart, until it found vent in the brick-throwing episode.

To persons concerned with labor relations this story will confirm the vital importance of adequate methods of settling grievances. None of management's problems is more important.

Wanted: Ten Thousand Solomons

THE "G.I. BILL OF RIGHTS" LAW, recently enacted, imposes some interesting obligations on the Director of Selective Service. The legislation says that the returning soldier is entitled to restoration of four items, job, status, pay, and seniority. It makes the Director responsible for enforcing these rights.

However, the Director's job is complicated by the circumstance that the Act, although it waives conflicting laws, provides escape for the employer if compliance is "impossible" or "unreasonable." Probably nothing less than 10,000 Solomons is necessary to decide whether the multitudinous conflicts that will arise call for compliance, escape, or compromise.

The restoration of seniority promises to be a knotty problem, particularly in organizations which are unionized. A host of differences is likely to arise, any solution of which will cause some dissatisfaction. It must be decided whether "restoration" means return to the actual status occupied when the soldier left or advancement as though he had remained in the organization. The law is not specific on this point.

We earnestly recommend to employers that they

should iron out a policy in advance, before they are caught unprepared by a flood of claims. In cases where employees are unionized it is important that employer and union find a basis for agreement.

Presumably, both employers and unions will be inclined toward giving the returning soldier the best possible "break" out of appreciation for the sacrifice he has made in our behalf. Nevertheless, this presumption affords no basis for deferring consideration until the "shooting starts." Here is a problem for which it is well to be prepared if serious "headaches" and injustices are to be avoided.

MILLING AROUND

The hundred thousand youths becoming eighteen each month will account for a sufficient portion of Army-Navy replacement needs to make the drafting of men over twenty-six unlikely unless the European war drags out.

At the Bretton Woods international monetary conference, the delegation from India made it known that they were not interested in remonetization of silver.

Hot spots in the war production program are in malleable castings and large tires, both needed to put our Western Front advance on wheels. Production of both these items is decidedly behind schedule. Steel, which loosened up a little a few months ago, is again extremely tight.

Charles Wilson's departure from WPB to return to General Electric is being delayed because of the insistence of Army and Navy officials. They like Wilson—who is a man who gets things done—so well that they keep pressuring the White House to urge Wilson to stay.

Reports on current handling of battlefield scrap indicate that although usable parts are salvaged for maintenance and repairs, there is little flow of scrap back to the metal markets. Useless equipment is simply piled up to await salvage.

One of the handicaps to resuming production of civilian goods, even though manpower and materials may become available, is the dearth of component parts such as fractional-horsepower motors and ball bearings. Most informed opinion is that little progress will be made on new civilian goods production before X-day.

We note that the Minneapolis office of the War Production Board advertises for sale "1-Lot consisting of shafts and hoists complete. . . ." Wonder if the shafts are collapsible or can be shipped in convenient lengths. Page the brass mines!

Utterances of Washington officials indicate a leaning toward the Leith proposal to control the international flow of minerals to prevent accumulation of stockpiles by belligerently inclined nations. The alternative proposed by Merica, to prevent manufacture of military equipment and let raw materials alone, does not seem to be making headway.

The Russians are reported to be much more cordial toward Americans than to the British. This is not simply because Stalin and Churchill do not get along too well, but because the Russians believe that Britain is likely to revert to its traditional policy of maintaining a balance of power in Europe. They do not suspect the United States of harboring any such designs. Behind the scenes is also the circumstance that Britons have some reservations about making hash of the German nation, which was one of their best prewar customers.

The Russians are anxious to purchase as much American mining equipment as they can obtain on long-term credit. On the other hand, and contrary to the expectations of many people in this country, they do not expect to be large exporters of minerals.

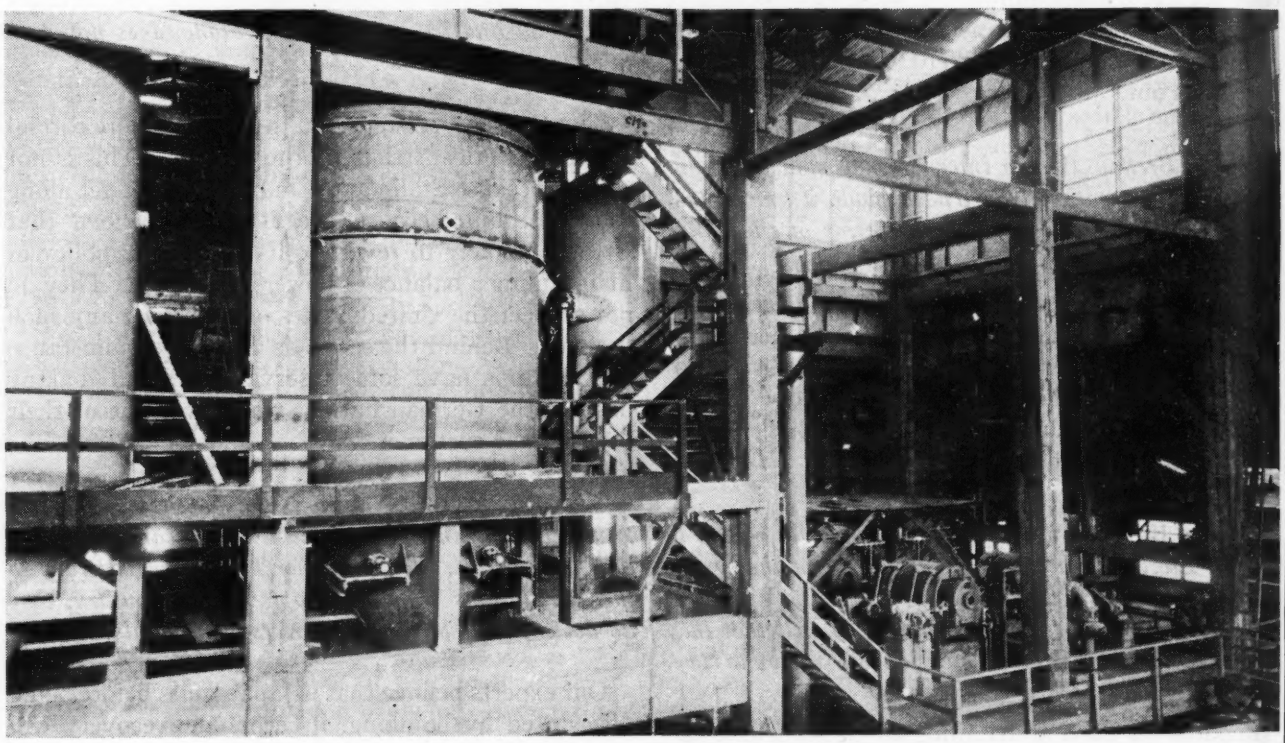
Our experts believe that if Japan quits before being devastated by bombing, its economic recovery will be rather rapid, simply because the Japanese people are accustomed to regimentation and the country's commerce is closely knit, being dominated by a few large firms. On the other hand, China, being individualistic, loosely organized, and seriously disrupted by a long war, will have a much tougher job. The Chinese will need considerable help from us if we wish to effectuate our hope of making China the center of Oriental power.

It looks from here as though the resolution at the Bretton Woods monetary conference to give silver further study by interested nations was a diplomatic way of giving silver the brush off.

In the first quarter the Army salvaged in the United States and sold 30,433 tons of non-ferrous metal, including fired cartridge cases, 47,226 long tons of iron and steel, and 3,827 long tons of tin cans. This gives an inkling of the metal avalanche which may hit the metal markets after the war if no adequate stockpiling policy is worked out.

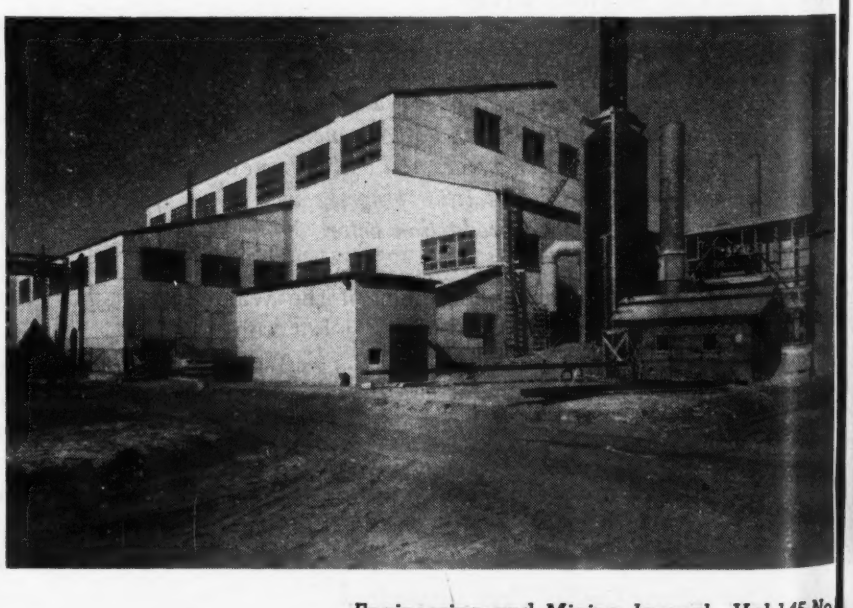
MAGNESIUM METAL FROM

"This enterprise has demonstrated the feasibility of recovering the entire ultimate values in products from ore mined in New Mexico from government-owned land, the production of muriate of potash, sulphate of potash, magnesium metal, and hydrochloric acid from Carlsbad ores, leaving only the common salt and dirt from the ore as unused products."—Louis Ware, president, International Minerals and Chemical Corporation



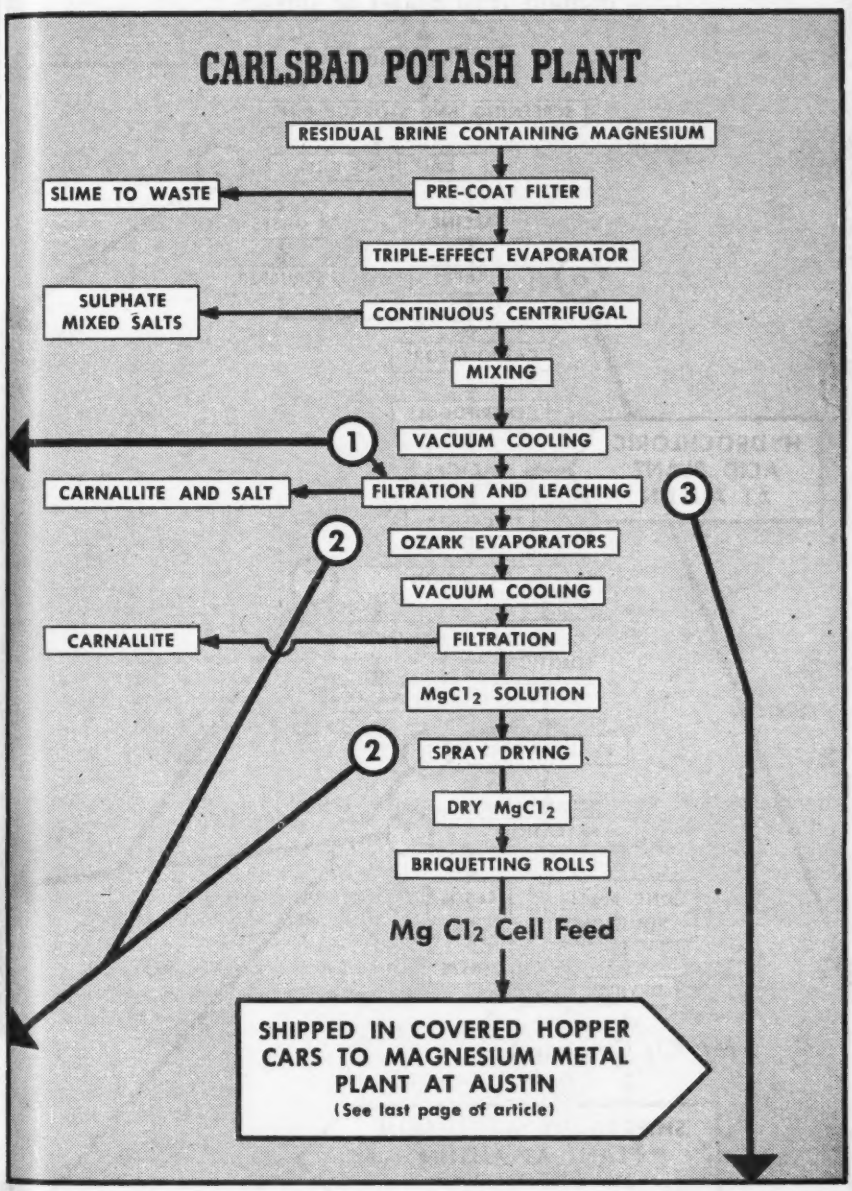
AT CARLSBAD, preparation of dry magnesium-chloride cell feed from the potash refinery end liquor involves evaporation, cooling, crystallization, and filtration at various points, as shown in flowsheet on opposite page. Here are seen the vacuum crystallizers at the left of the carnallite filters.

ANTICIPATING that the World War was bound to bring a great increase in demand for potash and magnesium, the management of International Minerals and Chemical Corporation[1] with shrewd foresight erected its new refinery at Carlsbad, New Mexico, in 1940, and proceeded to treat the potassium and potassium-magnesium ores which it had



[1] *This was in the latter part of 1940. International was then known as International Agricultural Corporation and its potash mining subsidiary as Union Potash and Chemical Corporation. The latter's mine and refinery were described in much detail in the April, 1941, issue of E.&M.J. Late in 1941, the Union company was merged into the parent company, which at the same time adopted its present name.*

CARLSBAD POTASH



begun to mine in that area. The new plant was put into commission just as the demand was beginning to expand. Production of potash salts, both the chloride and the sulphate, was begun immediately, utilizing the company's sylvinite and langbeinite ores as raw materials. Recovery of the magnesium became an actuality in 1943.

The sylvinite ore is the source of the chloride of potash sold by the company. It is a mixture of two minerals, sylvite and halite, sylvite being potassium chloride and the latter common salt. The salt is regarded as waste material. Langbeinite, the double sulphate of potassium and magnesium (K_2SO_4.-$2MgSO_4$), is mined in a separate seam and is, generally speaking, the source of the company's sulphate of potash,[2] as well as a part of the magnesium metal produced by International for the U. S. Government, as will be told in this article.

For some months after International's refinery went into production of sulphate of potash, the magnesium content of the langbeinite ore so used was not recovered, inasmuch as no scheme for utilizing it had been completed, although research was under way. Instead, the magnesium, converted into a chloride from its original sulphate form as a result of the base-exchange process used in making sulphate of potash for sale, found its way into the end-

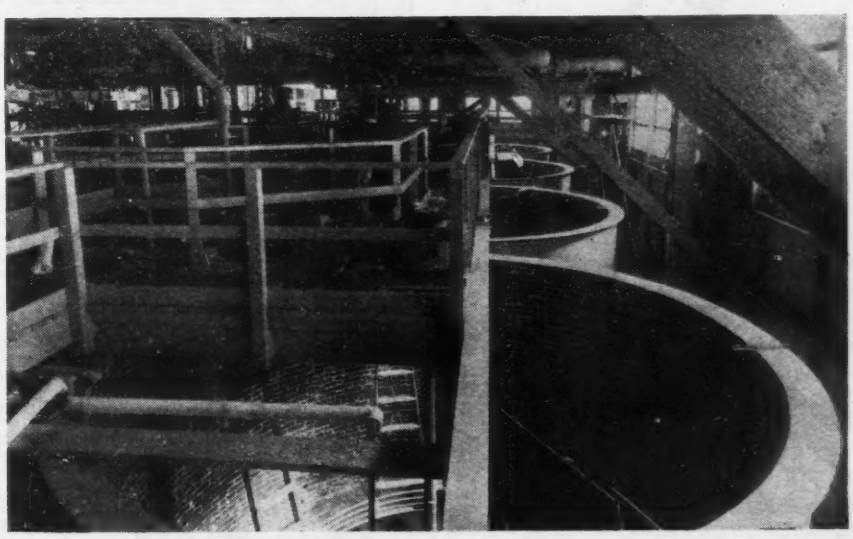
[2] *International is the only company mining langbeinite at Carlsbad and the only producer of potassium sulphate in the district from its own ore.*

←

SPRAY DRYERS (opposite) in the Carlsbad cell-feed plant dry the magnesium chloride produced so rapidly that it does not decompose. The stack of one of the submerged-combustion evaporators can also be seen.

→

POTASSIUM SULPHATE, produced from the langbeinite ore at Carlsbad in the base-exchange process of which the magnesium chloride is a byproduct, is removed from solution by reaction and precipitation in these brick-lined processing tanks.



liquor which was discarded as waste.

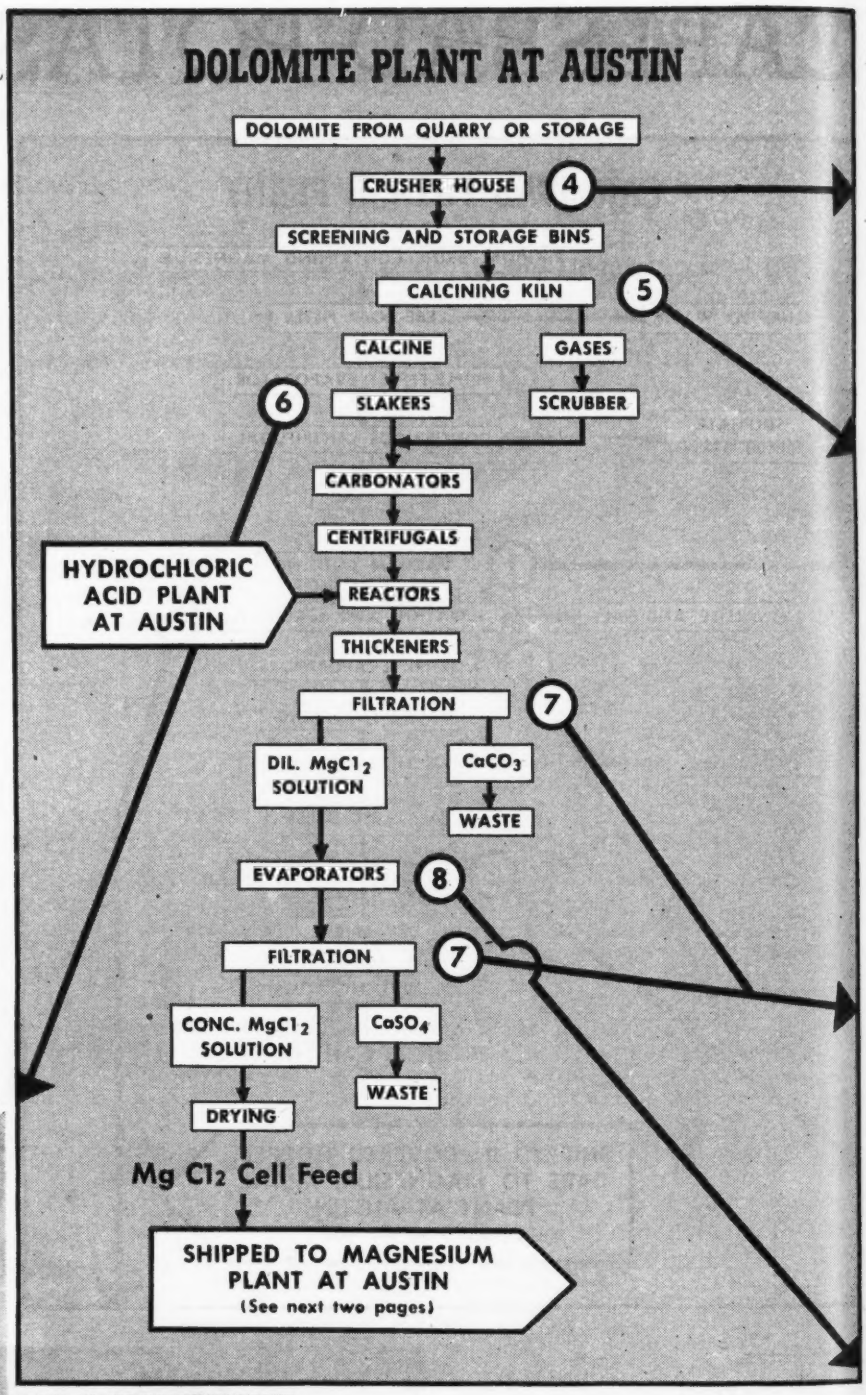
This byproduct liquor, in the quantities produced, constituted an important source of magnesium chloride, supplies of which were even then being sought by the government as raw material for making magnesium metal for war purposes by the Dow Chemical Co.'s process. This process, involving the electrolysis of molten magnesium chloride in the Dow-type cell, was regarded at the time in this country as offering the only sure way of getting a supply of metal quickly.

It was not surprising, therefore, when International offered to make its supply of magnesium chloride available, and to design, build, and operate a metal-reduction plant for Uncle Sam. Plans were quickly agreed upon by the War Production Board, the Army Air Corps, and the Defense Plant Corporation, and the Dow process and experience were, in turn, made available to International.

Process Starts With Base Exchange

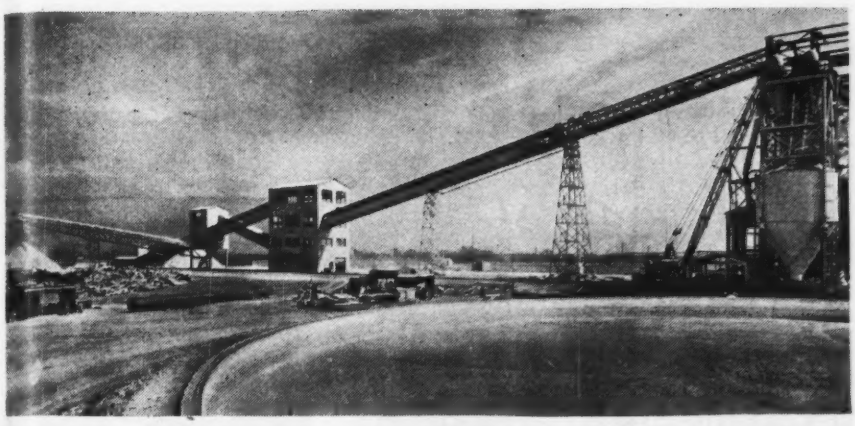
As will have been perceived by this time, the procedure followed in producing cell feed at Carlsbad lies in the realm of the physical chemist and chemical engineer. It starts with the base-exchange process used in producing potassium sulphate from langbeinite ($K_2SO_4.2MgSO_4$) with the aid of sylvite (KCl).

In the exchange of potassium and



← SLAKING of the calcined dolomite is the next step and is done in this unit close to the discharge end of the rotary kiln. The slaker may also be seen in an accompanying picture.

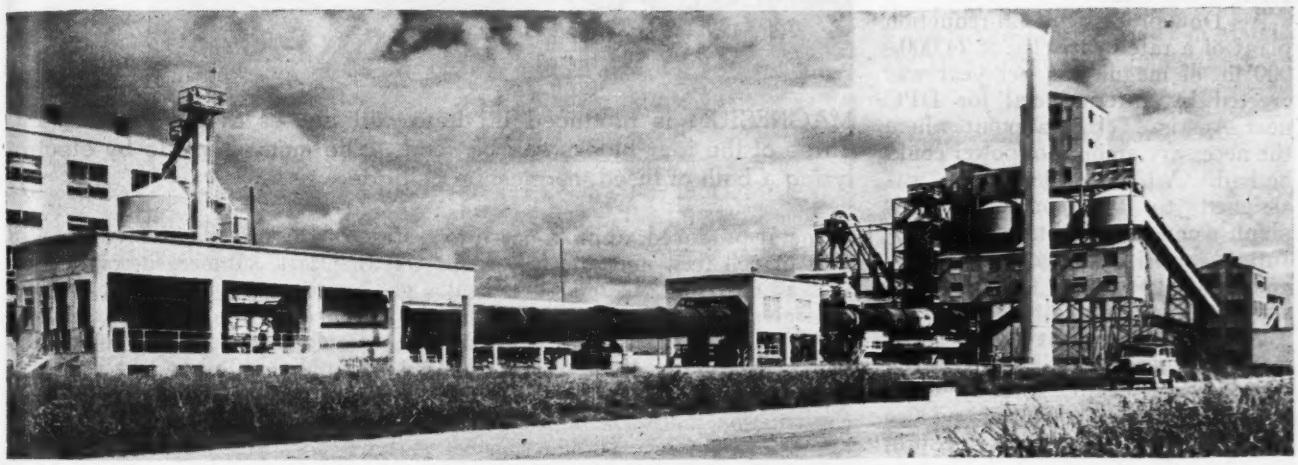
EVAPORATION of the dilute magnesium chloride solution in the dolomite plant to reduce its bulk and to throw out any contained calcium sulphate is carried out in four submerged-combustion evaporators, here seen adjacent to the filter building. →



DOLOMITE quarried at Burnett, Texas, is shipped to the dolomite plant adjacent to the magnesium plant and converted into magnesium chloride cell feed with the byproduct HCl. Here the stockpile is seen at left, from which it goes to the crushing plant.

←

CALCINING of dolomite drawn from the bins at the right is accomplished in this rotary kiln, which is fired with natural gas.



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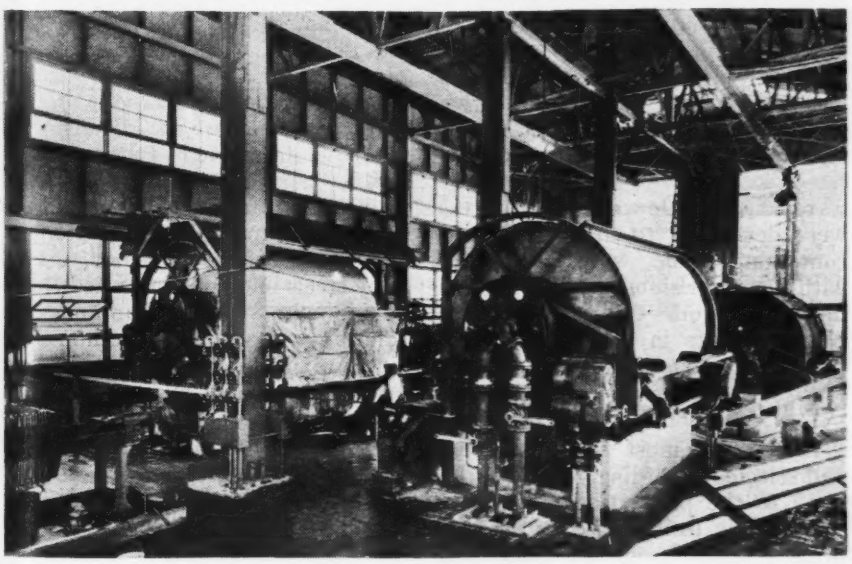
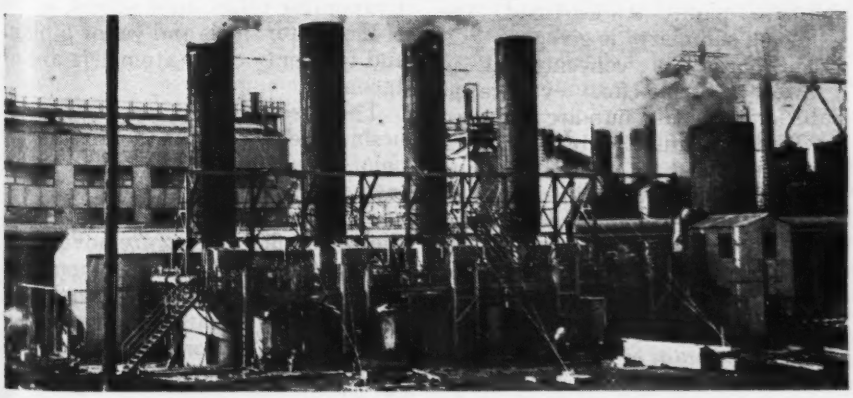
FILTRATION of waste calcium carbonate and calcium sulphate, respectively from the dilute and concentrated magnesium chloride solutions, is done in a separate building in the Texas dolomite plant. Note the three types of filters.





magnesium ions effected between the langbeinite and sylvite, whereby potassium sulphate is precipitated, it is not possible to recover all the potassium as sulphate, and, due to this and to the presence of sodium chloride associated with the langbeinite ore, the solution left after the removal of the crystallized sulphate contains potassium, sodium, magnesium, chlorine, and sulphate ions in a concentration totaling about 30 percent solids on the average.

Of these constituents, the potassium and magnesium chlorides and sulphates are of value, but to realize this value they must be separated from each other and from sodium chloride and sodium sulphate. A process for such a separation had been nearly completed at the beginning of 1941 when the government began its search, as already stated, for magnesium chloride in order to

produce the metal by electrolysis of a molten bath of this substance.

In the electrolysis of fused magnesium chloride by any process, the molten bath is mainly a mixture of several chlorides. Although some variation in percentage of each of the components is allowed, it is possible only between certain definite limits, because such variation controls important physical properties of the bath, such as melting point, specific gravity, fluidity, surface tension, electrical conductivity, and heat conductivity. These, in turn, govern current efficiency and smooth operation of the cells.

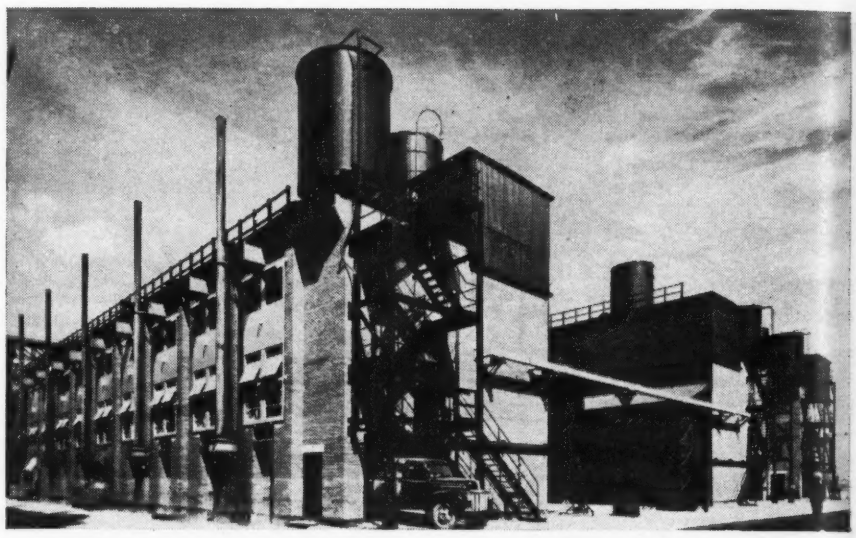
A Dow-process metal-reduction plant of a rated capacity of 24,000,000 lb. of magnesium per year was erected by International for DPC near Austin, Texas, a point where the necessary amount of power could be had. A block of 35,000 kw. was assigned to the company. This plant went into commission under International's management at the end of October, 1942, nine months after breaking ground.

At the Texas plant hydrochloric acid as 20 percent HCl, recovered in an auxiliary plant, directly as a byproduct of the electrolysis and also by conversion of the chlorine produced in the electrolysis, is used to make the major portion of the magnesium chloride cell feed from dolomite especially mined for the purpose at Burnett, Texas. The production of cell feed at Carlsbad thus made up the difference between the total cell feed required and that produced at Austin. Finally, certain magnesium alloys for wartime purposes are also made at this plant.

Maintenance of smooth cell operation is important because this means lower labor costs and lower hazards to operators. This can be attained only by holding the bath to proper composition and keeping dangerous impurities out of the feed. The danger point of certain of these unwanted impurities is as low as 50 parts per million of cell feed. All sources of impurities must be carefully watched.

The Carlsbad Brine

Specifically as to the brine available from International's potash operations, the sulphate must be held as low as possible: otherwise it will increase electrode consumption. Sodium and potassium chloride must be kept low enough to permit their removal with the usual amount of sludge withdrawn from the cells in order thus to maintain a constant composition of bath. For every ton of metal produced, approximately 5 tons of cell feed must be fed, so if the cell feed contains only 1 percent of a given impurity, 100 lb. of this impurity will enter the cells with the feed necessary for 1 ton of metal.



MAGNESIUM is produced in these cell houses at the Texas plant. Three of the four blocks can be seen. The metal is made by electrolyzing a bath of fused magnesium chloride.

Considerations of equipment and construction materials impose great limitations in the production of magnesium chloride. Corrosion is the greatest limiting factor, due to the production of hydrochloric acid caused by hydrolysis of the chloride by heat. Magnesium chloride forms a number of hydrates with water, and so great is the difficulty encountered in removing this combined water that the Dow cells and process were developed to use a cell feed containing some water combined with the magnesium chloride. Heating magnesium chloride solutions always results in the formation of some hydrochloric acid, thus:

$$MgCl_2 + H_2O = MgO + 2HCl$$

Equipment must be constructed and selected accordingly.

As to the production of the dry $MgCl_2$ cell feed desired from the brine received from the potassium sulphate plant at Carlsbad, the following summary[3] is given:

The brine is concentrated in a Swenson triple-effect evaporator. Salts crystallizing out are removed by Bird centrifugal filters, and the liquor is cooled in a batch vacuum crystallizer, where additional salts are removed and filtered. Further steps in the process involve use also of an Ozark submerged-combustion gas-burner evaporator and Peebles spray driers for drying the magnesium chloride solution. The drying is so rapid that only a small amount of decomposition takes place.

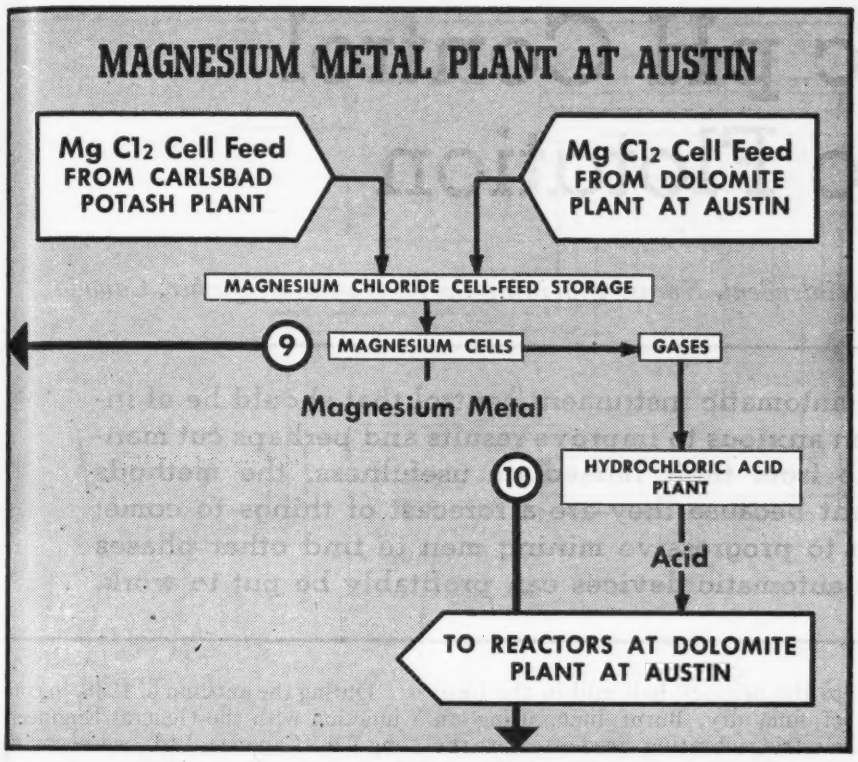
In the final product, the ratio of $MgCl_2$ to water in the product is represented by $MgCl_2.1H_2O$. After collection, the powder is briquetted and shipped to the metal-reduction plant in Texas.

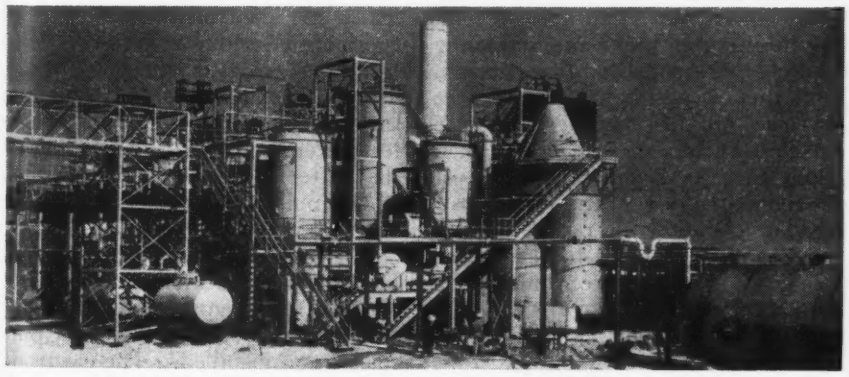
One of the problems met at Carlsbad was that of water. The supply available from wells runs upwards of 8,000 parts per million of dissolved solids. As a result the plant and the boilers are run on distilled water.

Because of war demands, use of alloy steels in equipment was held to a minimum. Tanks handling hot solutions containing magnesium chloride are of brick-lined steel. The evaporator bodies and some of the crystallizers and salt settlers are of steel, lined first with Pyroflex and then with acid-proof brick. Crystallizers operating at lower temperatures are rubber-lined. Bird centrifugals are of Monel metal. Evaporator tubes, tube sheets, parts of the heater shells and vapor piping, and the spray dryer atomizers are of Inconel.

The gases evolved from the magnesium cells contain a mixture of chlorine and hydrochloric acid totaling approximately 5 percent. These are processed in a separate plant, the acid first being removed by scrubbing with water. Then the chlorine is converted to hydrochloric acid in a regenerative converter by reaction with water gas, the acid so formed being removed by water in a

[3] *Readers desiring details of the chemical process will find them in the May, 1944, issue of Chemical and Metallurgical Engineering, in an article by P. D. V. Manning and Sidney D. Kirkpatrick.*





HYDROCHLORIC ACID is made in this plant (which is accessory to the electrolytic plant) from the chlorine gas and hydrochloric acid vapor produced in electrolyzing the fused magnesium chloride.

scrubber which follows. The hydrochloric acid is produced as 20 percent acid, but equipment is being modified to produce higher concentration. This will permit a lower cost from its use because of less water in the solution of magnesium chloride obtained by neutralizing magnesium hydroxide further on in the process; or the stronger acid may be available as a salable product.

The Dolomite Plant

To utilize this acid in making additional $MgCl_2$ cell feed, magnesium hydroxide is produced at the Texas plant from selected dolomite, quarried at Burnett, Texas, and shipped to the magnesium plant for calcining in a Smidth rotary kiln fired with natural gas. The burned dolomite is slaked in a Dorr continuous slaker and the resulting slurry is fed continuously to two series of three turbo-mixer carbonators. Each of these is fed with gas from the dolomite kiln, which has been scrubbed with water to cool and clean it. Water scrubbing has not been found entirely satisfactory for this cleaning and a Cottrell precipitator has been installed. The gas then enters Elliott turbo-compressors and is delivered to the carbonators at about 5-lb. pressure.

The carbonation process is highly efficient, and although provision was originally made for using the stack gases from the boiler plant in case of emergency, this has not been found necessary. Carbonation proceeds until completed.

At this point the slurry is passed through Bird centrifugal filters, which remove a portion of the water, the resulting cake passing to the neutralizing section, where, in turbo-mixer tanks, the magnesium chloride is neutralized with hydrochloric acid. There results a slurry of calcium carbonate suspended in a solution of magnesium chloride, and the carbonate is removed by filtration.

The magnesium chloride solution is concentrated by means of a battery of Ozark submerged-combustion evaporators to a content of approximately 34 percent $MgCl_2$. At this point the residual calcium is removed as calcium sulphate and the solution concentrated and dehydrated to $MgCl_2.1\frac{1}{2}H_2O$ in standard Dow-designed equipment.

Credit to Whom Due

It is difficult to bestow credit adequately to all who have participated in the development. Louis Ware, president of International, conceived and guided the enterprise, while the entire magnesium project was in direct charge of J. P. Margeson, Jr., vice president. The processes in use at Carlsbad and at the magnesium plant were conceived in the Research Division of International under the direction of Paul D. V. Manning, vice president in charge of research. In the case of the magnesium chloride process, much of the credit is due to the work of W. E. Burke and W. A. Smith. Pilot-plant work was carried out at Carlsbad with the help of R. A. Lindsay and A. J. Barnebl; W. L. Badger acted as consultant in the last-named work and on the evaporator design. Credit for development of the dolomite process is shared with H. Lundin and H. H. Cudd, among others in the Research Division. Pilot-plant work was carried on at the Dorr Co.'s Westport laboratory largely under the direction of C. L. Knowles. Dr. Colin G. Fink acted as a consultant on the entire project. All of the final design and construction work of both plants was in charge of James A. Barr, chief engineer of International.

In charge of plant operations at Carlsbad are George T. Harley, recently appointed general manager, and John Burrows. At the time the work described was done, H. S. Martin, now retired, was general manager. At the Texas plant the operations are in charge of William B. Leach as manager, with important contributions being made by Nelson White and Kenneth Turner, assistant managers.

Automatic pH Control Applied to Flotation

D. E. BOURKE, *Mill Superintendent, Normetal Mining Corp., Normetal, Quebec, Canada*

Here is an example of automatic instrument control that should be of interest to all mining men anxious to improve results and perhaps cut man-hours per ton. Aside from their immediate usefulness, the methods described are important because they are a forecast of things to come; they are an invitation to progressive mining men to find other phases of the industry where automatic devices can profitably be put to work.

THE MINE and concentrator of Normetal Mining Corp. is situated in Northwestern Quebec, about 12 miles north of Dupuy, on the Canadian National Railways. Operations were started during 1937, at a nominal capacity of 250 tons per day, which has since been raised to 800 tons.

The ore is mainly siliceous gangue, pyrite, chalcopyrite, and sphalerite, with minor amounts of pyrrhotite, galena, magnetite, gold, and silver. It is crushed and ground to approximately 84 percent minus-200 mesh, given a short conditioning, and then floated for copper. The rougher concentrate is cleaned and recleaned. Copper middlings are returned to the conditioner. The copper tailings are conditioned and the zinc is floated. The zinc section flowsheet resembles that for copper, except that three stages of cleaning are available.

Initial plant and laboratory work showed properly controlled alkalinity to be one of the most important factors governing recoveries and grades in both the copper and zinc concentrates. All subsequent work has confirmed this finding. The three graphs on page 77 were made up from results of recent laboratory work and are typical. They show clearly the effect of alkalinity on recovery and grade of concentrate.

By all data, an optimum pH of 8.8 to 9.0 for the copper-circuit rougher feed was indicated. Likewise, a pH of 10.7 to 10.8 was indicated for the zinc circuit. In the copper section, there is only a slight drop in pH through the circuit, and in the zinc section, the pH holds almost constant.

Lime for the copper circuit is fed to the primary ball mill in the form of fine, dry, burnt lime, using an electric vibrating feeder. For the zinc circuit, the same lime is fed by a belt feeder to a 12x20-in. ball mill, the resulting milk of lime then going directly to the zinc conditioning tank.

At first, a colorimetric comparator was used for pH readings. Its use was not satisfactory for these reasons:

To get the required number of readings, too much time was lost. Also, filtering and re-filtering of samples were required to get a clear solution. Furthermore, unless the first 30 or 40 cc. of filtrate was discarded, the reading was likely to be off considerably. It was found that almost all filter papers would affect the solution to some extent.

An additional reason was that most men had trouble in distinguishing graduations in color, particularly in the 9.6 to 11.2 range, and were often four or five points or more in error. Finally, with readings taken at hourly intervals, it was difficult for the operator to tell whether the alkalinity was increasing, decreasing, or stationary.

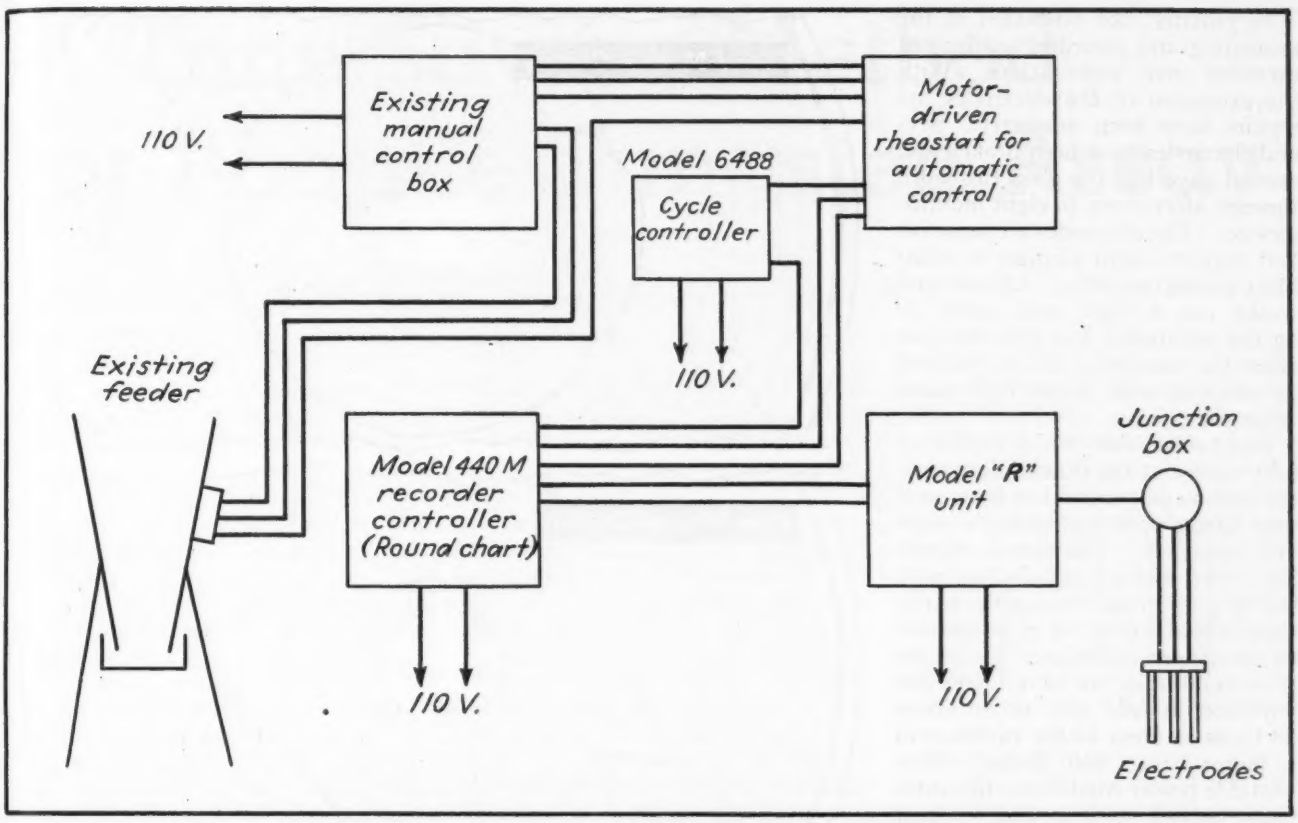
Repeated checks in the plant showed that there were wide and persistent swings in the pulp akalinity.

For the copper circuit, it was concluded that if the pH could be held at the desired point, it would result in: 1. An increase in the grade of copper concentrate and hence an increase in the net smelter return per pound of copper. 2. A lowering of the amount of zinc in the copper concentrate. 3. A slight saving in the amount of lime and promoter necessary. 4. Stabilization of the froth condition and steadier operation of the circuit.

During the autumn of 1938, in conjunction with the General Engineering Co. (Canada), Ltd., we began to investigate the possibilities of automatic pH control and the various types of pH meters available. Some tests were carried out in Toronto, using our pulp and a Beckmann laboratory-model pH meter. These tests were successful, and showed that after several days' immersion in the pulp, no coating or blinding of the electrodes occurred.

As a further test, an industrial Model "M" Beckmann pH meter, with a flow-type electrode flow chamber and 90-ft. leads, was purchased and installed. The electrode flow chamber was piped up to the primary copper rougher feed and the leads were carried in a conduit to the operators' bench about 80 ft. away. From the start, this meter proved satisfactory. There was some improvement in the circuit control, because the operators had a continuous pH reading and were able to make corrections more often. After a few months, we were satisfied to proceed with the installation of an automatic pH recorder-controller.

The Bristol Co. of Canada, Ltd., agreed to furnish the equipment and make the installation. The electric vibrating feeder used for feeding the lime was adapted for automatic control by adding motor-driven rheostat controls. The remainder of the equipment consisted of: one Beckmann Model "R" pH meter, range 6 to 13; one flow-type electrode assembly, No. 8630 complete with glass electrode, calomel electrode, resistance thermometer, and 10-ft. lead wires; one junction box No.



THE pH CONTROL EQUIPMENT, automatic and electrically operated, which has proved successful at the Normetal mill, in Quebec, since its installation in 1940, is arranged as indicated here schematically.

8650 and one 85-ft. length of shielded cable with terminals; one Bristol Model 440M round chart Recorder-Controller; and one cycle controller model No. 6488. Excluding the lime feeder, the equipment cost $1840.

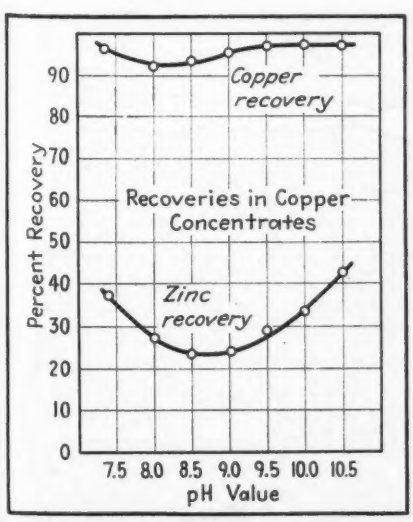
Installation was made and operation started in November, 1940. Provision was made for either manual or automatic adjustment of the feed rate of lime.

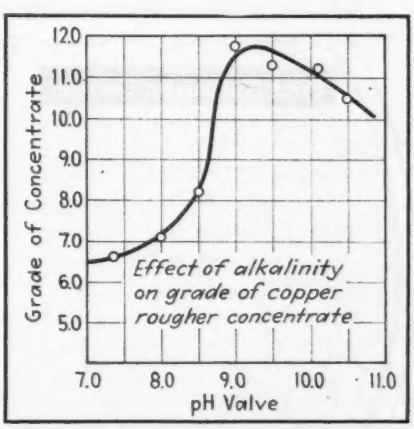
The setting for automatic operation is made as follows: Adjustable contacts in the 440M cabinet are set for the pH range desired; if the alkalinity either increases or decreases to the limits set, contacts are closed, operating the reversible motor on the rheostat controls of the lime feeder for a definite period. This period and frequency of operation is in turn controlled by the cycle controller. The timing of the cycle controller must be set so that the effect of one correction shows up before another correction is made.

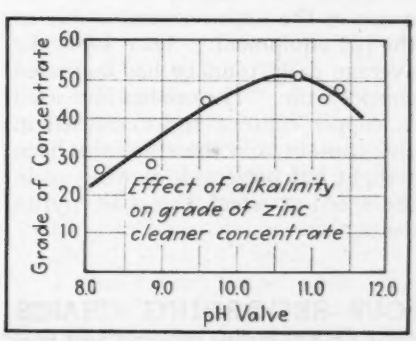
(*Continued on page 78*)

COMPARISON OF COPPER RECOVERY AND GRADES

	Years 1938–39–40	*Years 1941–42–43*
Head assay, % Cu	2.70	3.02
Head assay, % Zn	7.88	6.84
Copper concentrate assay, % Cu	22.84	23.24
Copper concentrate assay, % Zn	6.63	5.79
Recovery in copper concentrate, % Cu	91.21	92.82
Recovery in copper concentrate, % Zn	9.13	10.48







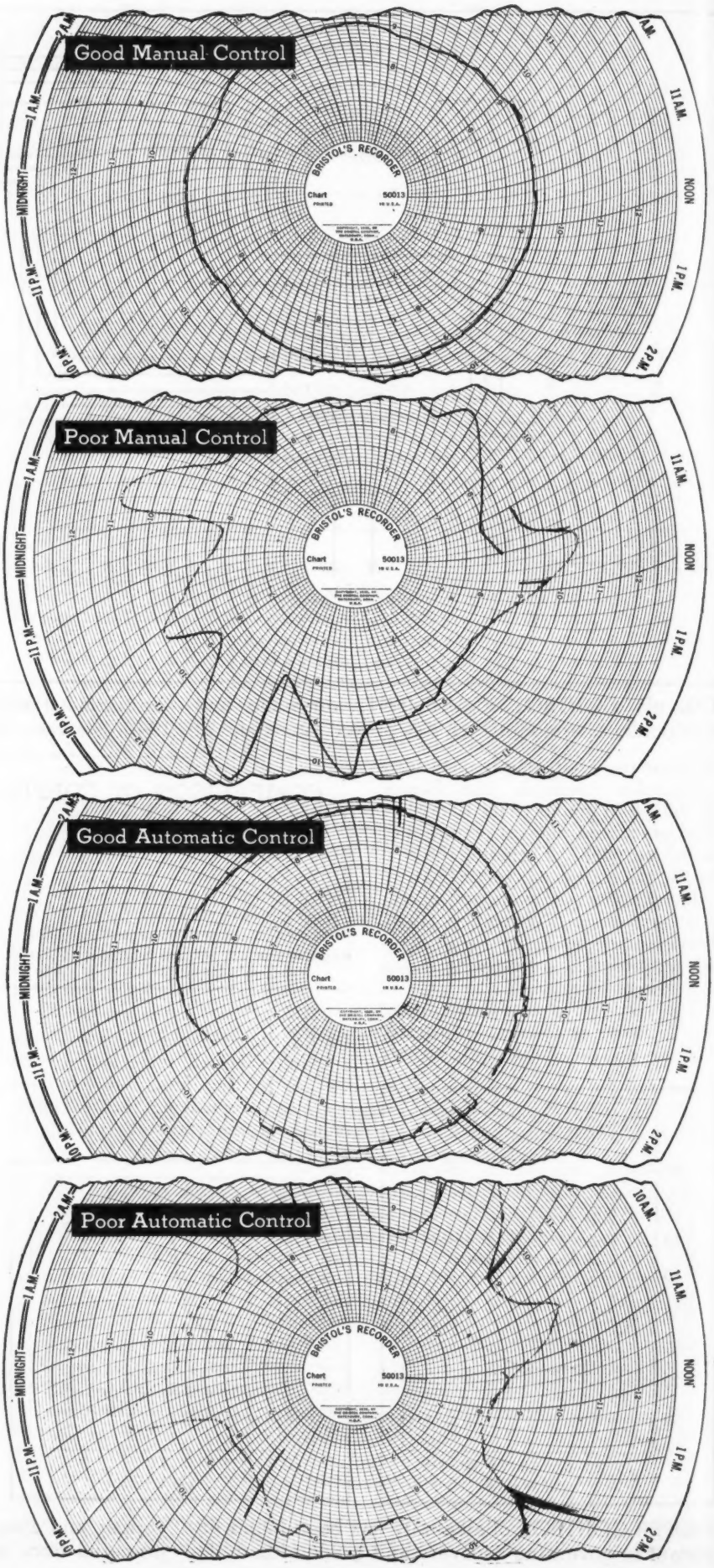
PROPER CONTROL of alkalinity has been found important in governing recovery and grade of both the copper and zinc concentrates. These graphs were prepared from results of recent laboratory work.

In practice, the operation of the measuring and recording equipment exceeded our expectations. With the exception of the electrodes, no repairs have been necessary. Several electrodes have been broken and several have had the glass tips worn through after seven to eight months' service. The electrodes are sensitive and register slight changes in alkalinity almost instantly. After several weeks' use, a slight scale builds up on the electrodes, but this does not effect the sensitivity if it is removed by washing with dilute HCl about twice per month.

Due to conditions which we did not fully realize at the time of designing, the automatic control has been good only during periods of steady voltage and frequency. The electric vibrating feeder, which is satisfactory with steady power conditions, gives variations in feed rate out of all proportion to the power variation. Under the same conditions, we have found this variation in feed rate to be about 20 times as great as the variation of a motor-driven belt feeder. With unstable power conditions, the automatic control tends to under-correct and over-correct.

In conclusion, we can say that continuously measuring and recording of ore pulp alkalinity have proved to be satisfactory and practicable. The automatic control in our case has been only partly successful, due to local conditions and the type of equipment used. We think that most of the trouble might be overcome by adopting a thyratron-controlled d.c. motor for variable-speed control of a belt-type feeder. When electrical equipment becomes easier to get, we contemplate the installation of a recorder-controller for our zinc circuit.

The table on p. 77 gives a comparison between the years 1918, 1939, and 1940 and 1941, 1942, and 1943, showing that the copper recovery grades have improved. So many other factors are concerned that it is difficult to discern exactly how much of the improvement is due to the pH equipment. Since 1938, the average daily tonnage has increased considerably. The ore has increased in copper content and decreased in zinc content, and there has also been a slight but noticeable slowing up in the speed at which the chalcopyrite floats.



FOUR RECORDING CHARTS offering examples of good and bad control of both manual and automatic operation respectively.

A Time-Saving Method for Routine Tungsten Assay

KEITH H. GLEASON, *Analyst, Bradley Mining Co., Stibnite, Idaho*

WITH THE OBJECT of combining the best features of the several methods available for the determination of tungsten, I have developed the following method for Bradley Mining Co., at Stibnite, Idaho. A new reagent, Nemadine, is used, not as a substitute for cinchonine, but because it has been found superior to it, in both speed and accuracy. Nemadine is cheap and available.

The basic routine is taken from procedures developed by George Crerar and Donald B. Read, of Nevada Massachusetts Co. It has been expanded by my own experimentation and by details adapted from other methods. Nemadine was developed by R. J. Segerstrom, of Nevada Massachusetts' Research Division.

At Stibnite, most samples assayed contain between 0.6 and 10 percent antimony, but this method has worked well on these samples. I feel sure it will, with modifications, also prove satisfactory on most types of ore. Using it, tungsten determinations can be run on a batch of samples in eight hours.

Procedure

Grind scheelite samples to minus-100 mesh; grind wolframite or hubnerite samples to minus-200 mesh. The following weights for assay are suggested:

Percent WO_3 (Approx.)	Weight Sample (Grams)
Below 1	5.0
1 to 5	3.0
5 to 25	1.0
Above 25	0.5

Weigh samples into 500-ml. Pyrex tall-form beakers, add 10 to 15 ml. HCl, cover, and evaporate to dryness on the hot plate. Bake for a few moments if convenient. Add NH_4FHF (ammonium bifluoride), gram for gram of sample; then dilute with 20 ml. hot water and whirl to dissolve NH_4FHF.

Add 50 ml. HCl, 10 ml. HNO_3, 15 ml. $HClO_4$, and boil slowly until severe reaction ceases; then boil to fumes. This should be done only in a well-ventilated hood. Add 25 ml. HCl, boil down to 10 ml.; then dilute to 50 ml., using a jet of hot water to wash cover and sides of beaker. Police beaker well.

Add 20 ml. of the 25 percent Nemadine reagent and continue adding hot water to a total volume of 300 ml. Bring to boil on hot plate, and then add 20 ml. mascerated filter pulp. (Add 50 ml. 25 percent Nemadine reagent and three $1\frac{1}{2}\times1\frac{1}{2}$-in. filter tablets to 500 ml. hot water.) Set on warm hot plate (60 deg. C.) until clear. In this step, 3- to 5-gram samples sometimes bump on being heated to boiling. Swirling the beaker contents while heating will avoid this, and time may be saved by heating them over an open flame.

Precipitation and settling will ordinarily be complete in one-half to one hour. The supernatant liquor need not be entirely clear before filtering. A centrifuge may be used to speed precipitation and settling. A head holding four 250-ml. bottles would be acceptable, and a force of 200 times gravity is suitable.

Filter the samples with vacuum, using a 60-deg. Pyrex funnel and a 500-ml. Pyrex filter flask. Two thicknesses of 12.5-cm. Whatman No. 40 paper are used, with a platinum filter cone, and a little filter pulp should be poured in before filtering. Filter and wash with hot Nemadine wash solution (25 ml. Nemadine reagent, 10 ml. HCl, 1,000 ml. hot water). A Fisher Filtrator apparatus may be used.

Wash repeatedly until filtrate volume reaches about 400 ml. Remove funnel, discard filtrate, rinse flask, and then wash pulp out of funnel into original beaker, using as little water (hot) as possible. Add 10 ml. of 10 percent NaOH to beaker and bring to boiling. Swirl beaker while doing so, or the contents may erupt violently.

Reassemble filter apparatus and repeat filtration, washing five times with hot water. Then add 10 to 15 drops 10 percent NaOH and continue washing.

When filtrate reaches 150 ml. volume, test with three or four drops of $TiCl_3$ solution, prepared by 5 ml. $TiCl_3$ to 18 ml. H_2O, and 18 ml. HCl. If a blue color appears, add 10 more drops of NaOH solution and continue washing until blue tinge fails to appear. Volume should be less then 250 ml. Transfer to a clean 500-ml. tall-form beaker, rinsing flask four times with hot water. With phenolphthalein as indicator, acidify with HCl to a pH of 2 or 3. Add 25 ml. of Nemadine reagent, cover, and bring to a boil. Add 20 ml. filter pulp, cover, and let stand until clear, generally 1 to $1\frac{1}{2}$ hr.

Set up filter as before, but use only one 12.5-cm. Whatman No. 50 paper. Filter and wash with hot Nemadine wash solution, policing beaker thoroughly. Wash to 350 ml. volume.

Remove filter paper, fold, place in a 30-ml. Vycor crucible and ignite at not over 800 deg. C. for 15 minutes, or until all the carbon is driven off. Cool and weigh as WO_3.

Reagents and Apparatus Used

NEMADINE REAGENT

A 25 percent solution of Nemadine in distilled water, obtainable from Nevada Massachusetts Co.

SODIUM HYDROXIDE

Dissolve 55 grams of c. p. NaOH pellets in 450 ml. distilled water.

TITANIUM TRICHLORIDE

Use 4 ml. of a 15 per cent solution of titanous chloride, 18 ml. HCl, and 18 ml. distilled water.

NEMADINE WASH SOLUTION

Add 25 ml. Nemadine reagent and 10 ml. HCl to 1,000 ml. distilled water.

FILTRATION APPARATUS

Pyrex 60-deg. funnel, Pyrex 500-ml. flask, platinum filter cone.

Fisher Scientific Co. Filtrator, 400 ml. capacity can also be used.

SPEEDY-VAP WATCH GLASSES, *Fisher Scientific Co.*

PYREX TALL-FORM BEAKERS, *500-ml.*

VYCOR CRUCIBLES, *No. 790, 30-ml., 95 percent silica glass.*

A Tungsten Find in North Carolina

W. H. MUNDS, H. B. EWOLDT, and C. J. COHEN, *U. S. Bureau of Mines. Respectively Mining Engineer, Eastern Region, College Park, Md.; District Engineer, Norris, Tenn.; and Mineral Technologist, Norris, Tenn.*

A NEW TUNGSTEN AREA has been discovered in Vance County, North Carolina, by two brothers, Richard and Joseph Hamme. Specimens of ore were submitted by them to Dr. Jasper L. Stuckey, of the North Carolina Geological Survey, who identified them as hübnerite and assisted in the initial prospecting. This new district compares favorably with major tungsten areas of the western United States. Easy access via railway or ocean freight lines to a treatment plant on the Eastern seaboard should be advantageous.

In February 1943 the North Carolina Survey made a preliminary map of the area. The following May the U. S. Bureau of Mines began an extensive program for exploring the district by trenching, diamond drilling, sampling, and beneficiation tests; and from July to November 1943 the Bureau and the Federal Survey cooperated in mapping the area in more detail.

The Hamme tungsten district, as it has become known, is in the moderately rolling, eastern part of the Piedmont physiographic province, at elevations around 400 ft. Vein distribution is apparently controlled by a granite-gneiss schist contact and schist septums occurring in the granite. Tungsten deposits have been identified over an area measuring approximately 10 miles along the contact and 1 mile across it. The minerals occur in quartz veins, varying in width from 10 in. to 30 ft. and having diverse orientations. Predominating dips range from 80 to 60 deg. The veins swell, pinch, split, and have *en echelon* breaks. Slickensides show evidence of some post-mineral faulting. Present indications are that the orebodies have a distinct rake to the south.

The most productive orebody to date has been traced at the surface for 900 ft. and averages 10 ft. in width. At one place it is 30 ft. wide, due, it is thought, to the solutions having followed a cross fracture of the regular vein. Diamond drilling has proved this and other surface showings to be of approximately the same dimensions at 100 ft. in depth as at the surface. As prospecting continues, other important orebodies will undoubtedly be found, and known orebodies will be extended. Also, the existence of a proved tungsten orebody in the Piedmont physiographic province, which extends over a large part of southern United States, offers possibilities of finding additional ore deposits.

The principal tungsten minerals at the Hamme deposits are hübnerite and scheelite. The scheelite is in part of primary and in part of secondary occurrence. Other minerals of less economic importance, which have been identified

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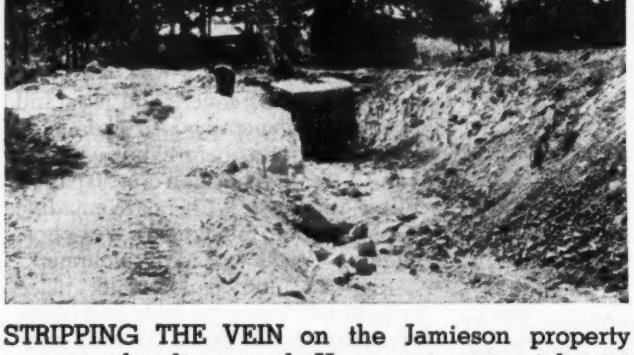
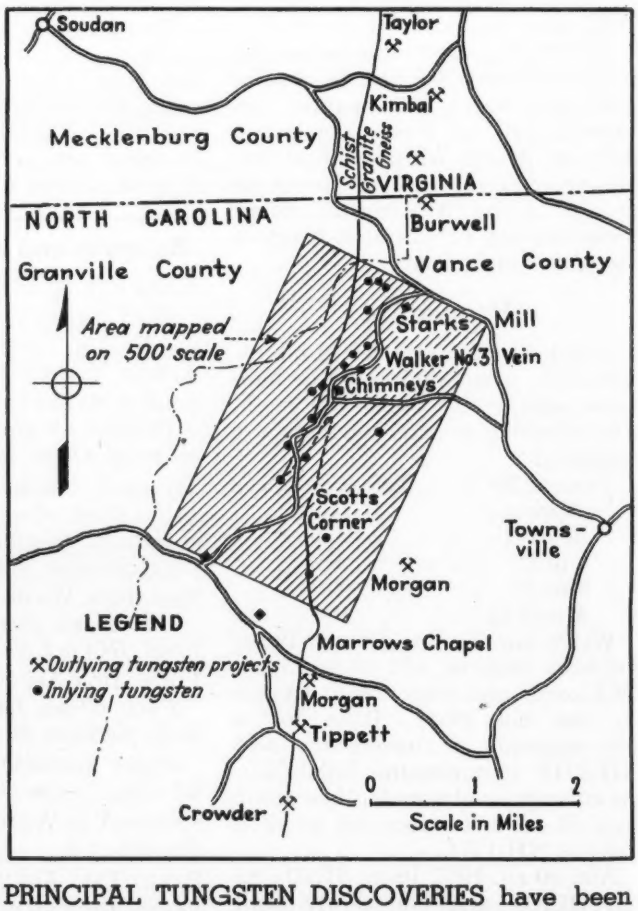


STRIPPING THE VEIN on the Jamieson property in recently discovered Hamme tungsten district located in Vance County, North Carolina.



PRINCIPAL TUNGSTEN DISCOVERIES have been made within the shaded area in Vance County. Wider extension of veins is probable.

in the ore by Bureau of Mines mineralogists, are rhodochrosite, fluorite, sericite, galena, sphalerite, pyrite, and chalcopyrite.

The State and Federal Surveys and the Federal Bureau of Mines have cooperated in making geological studies as well as in mapping the area. Included in this is a reconnaissance survey, aided by aërial photographs, of an area 10 miles long by 2 miles wide, and a detailed plane-table survey of an area 2 miles long by half a mile wide.

The Bureau of Mines completed 8,000 ft. of bulldozer trenches across the strikes and 7,000 ft. of diamond drilling, in order to prospect the veins and inventory the orebodies. In addition, it has taken more than 500 samples from the property and has completed petrographic studies, beneficiation tests, and chemical and spectrographic analyses of the samples at the Experiment Station at College Park, Md.

300,000 Tons of Ore

Haile Mines, Inc., and subsidiaries of Southern Aggregates Co. have done much surface trenching, some churn drilling, and some underground development work through shafts. Two of the Haile company's shafts have opened different orebodies at 100 ft. in depth. Crosscuts and drifts several hundred feet long have verified the Bureau's drilling results. To date those indicate more than 300,000 tons of ore averaging 0.96 percent tungsten trioxide, of which at least 230,000 units should be recoverable in salable form.

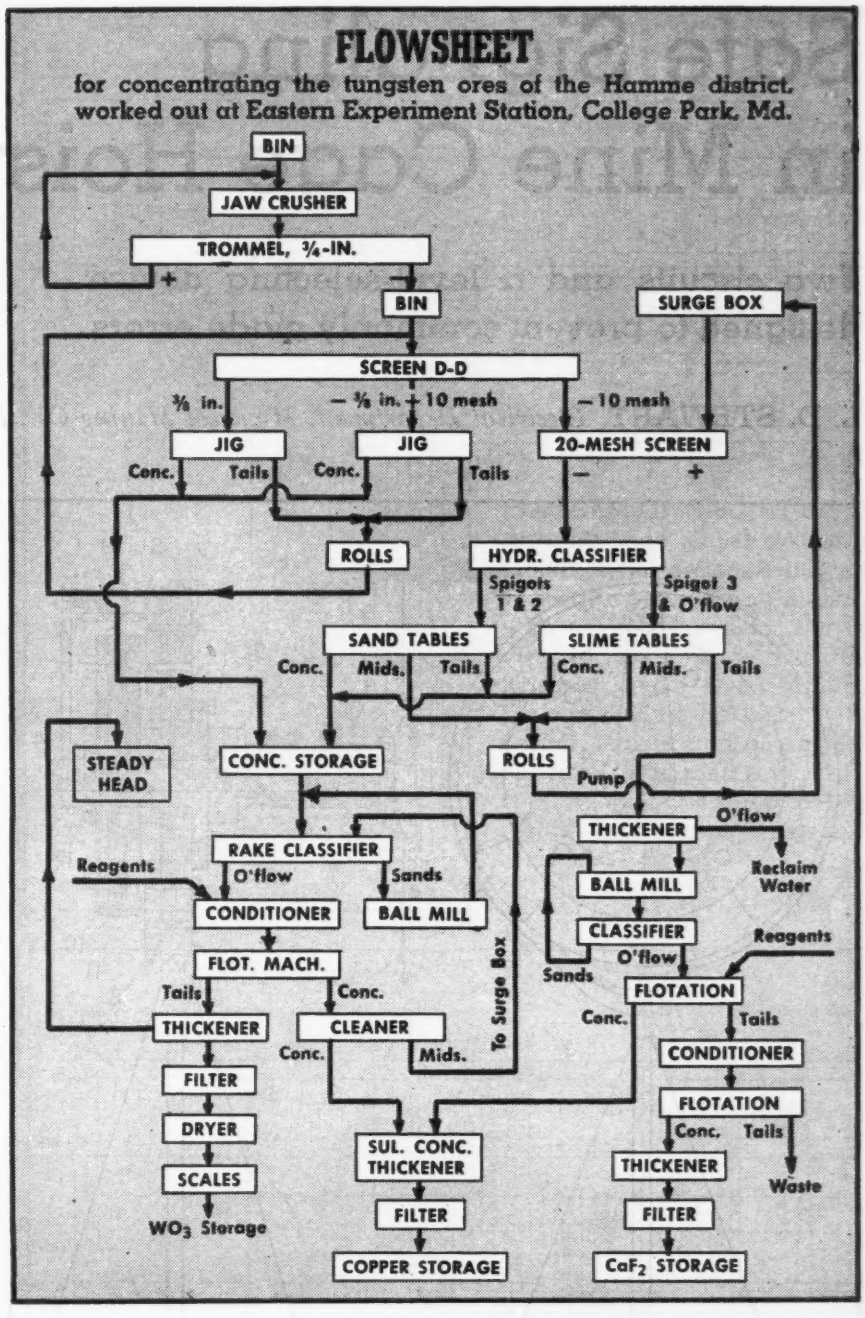
Hamme Bros. erected a crude gravity concentrator, using old gold-mining equipment, and operated it on oxidized surface ores. This operation produced a considerable amount of high-grade tungsten concentrates and was undoubtedly an economic success. Haile Mines, Inc., has purchased Hamme Bros. interests and is continuing milling operations on combined surface and underground development ores, while carrying on a construction and development program. The Southern Aggregates Co. has also built a gravity concentrator and treated some development ores in it.

Because of the low relief of the district, shafts will be used for opening the deposits. Mining is likely to be by shrinkage where the walls are good; otherwise by cut-and-fill. No major pumping problems are anticipated.

A mill flowsheet has been worked out from the Hamme ores at the Eastern Experiment Station at College Park, Md., by the Bureau of Mines. It involves stage grinding and close sizing for gravity concentration with jigs and tables. The concentrates are then ground through 80 mesh in a ball mill, reagents added, and the sulphides are floated off. The flotation tails are the tungsten concentrates, which have the following analysis: WO_3, 74.0 percent; Mn, 16.5; Fe, 0.255; Cu, 0.01; P, 0.005; S, 0.028; and SiO_2, 0.75 per cent. An over-all tungsten extraction of 85 percent is indicated. The flotation concentrate containing copper, lead, and silver could be sold.

As a temporary expedient, the Haile Mines, Inc., is using straight gravity concentration on the mixed ores. The tables yield a fair recovery in a low-grade concentrate, although the tailings still contain enough WO_3, to merit re-treatment by flotation. Recently arrangements have been made by Haile Mines, Inc., for re-treatment of its current output of mixed concentrates by the Wah Chang Trading Corporation, of New York.

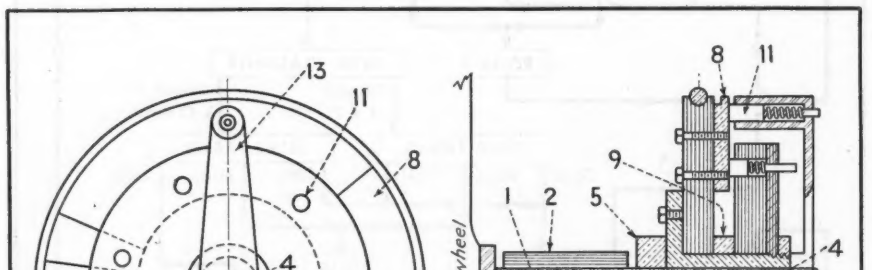
Under present conditions, over-all costs, including amortization, overhead, taxes, insurance, development, mining, milling, shipping, and brokerage, should not exceed $12 per unit of WO_3, which makes the district attractive for both wartime and peacetime production.



Safe Signaling in Mine Cage Hoisting

Two circuits and a level-selecting device designed to prevent commonly made errors

L. D. STEWART, *Electrical Department, Montreal Mining Co., Hurley, Wis.*



LEVEL SELECTOR on No. 5 cage hoist, in end view and vertical section through shaft.

1. Stub shaft on Lilly controller for driving connection
2. Rubber hose, flexible connection
3. ½x¼-in. bakelite insulator
4. ½-in. driving shaft of selector
5. Holding washer
6. Bearing
7. ½x6-in. bakelite
8. Brass contact segments
9. Brass spacing washer
10. Bakelite, ½x4½ in., for shorting switch
11. Shorting contacts, 13 required
12. Brass wearing washer
13. Segment contact arm

SIGNAL SYSTEMS FOR MINE CAGES have not been all that is desired, especially in respect to safety. Considerable improvement has been made in the past few years, particularly by the use of electronic equipment, and the new systems which have been developed have done much to make operation safer and more efficient.

Two new circuits are described here which do not utilize electronic equipment but nevertheless function in much in the same manner so far as safety is concerned, save that the electronic types generally operate from the cage only and from any point in the shaft whether the cage is in motion or not, whereas the type that is described here can be operated only from the switch at different levels.

Many Systems Unsafe

With many of the systems now in use, it is possible to ring a signal from any level at any time. Although check lights and other safety devices are employed in connection with them, it is still possible to have an accident because of reliance upon the human element to correct the error which is made when some one happens to give the signal from the wrong place.

Circuit No. 1 permits ringing a signal from only one level at a time and only when the cage is at that level or in the shaft not more than halfway to the next level. The indicator lights on every level show where the cage is, and anyone wanting it can call the cage tender by phone.

Whenever necessary, a signal can be given from any level by having the hoistman close the shorting-out switch on the selector. This is usually done when shaft work is in progress.

Circuit No. 2 has the same features

as No. 1 with the additional advantage of permitting the cage to be called by signal from any level when free. This is to be used where there is no regular cage tender.

With this circuit, when a person is through with the cage, he gives a ring-off signal, and the hoistman pulls the cage in the clear to a certain place off the level. When this point is reached, R-1 operates, closing R-4, and a light indicates the fact at the hoist and also on each level. With the cage at this point, it is possible to signal from any level to the hoistman.

The Level Selector

The level selector (see the drawing on opposite page) is the only part that may be new in this type of equipment. It can be made in any shop having a lathe of the proper size. As shown in the drawing, the main dial is 6 in. in diameter and of a height to fit the driving mechanism, which in this instance is a Lilly controller. It is driven by a stub shaft fastened to the hub and set in front of the controller.

The segments are of course cut to conform with the levels in the particular shaft for which the selector is used. Adjustments for rope stretch can be readily made in the coupling and also by shifting the segment section.

Although the circuit drawings are clear enough for those interested, I will mention a few points, by way of further explanation:

The resistance across the relay is a lamp and should be of value sufficient to carry the load of the indicating lamps and keep the relay open except when a switch is pulled. In this case, the lamps are 7½-watt, 110-volt.

Indicating lamps are placed in a partitioned metal box having sections, each about 2 in. square and of a depth to accommodate the lamp and totally inclosed except for the number of each level which is cut out in front.

On No. 1 circuit, the relay connected with the segment marked "relay" operates only when the shorting-out switch is used, thereby cutting one side of the indicating lamp circuit. Otherwise they all would light up and the load would be too heavy for the resistor across the relay, and the relay would close and signals could not be given. This shorting-out switch would be used only when men were working in the shaft and when it would be necessary to be able to give signals from more than one point.

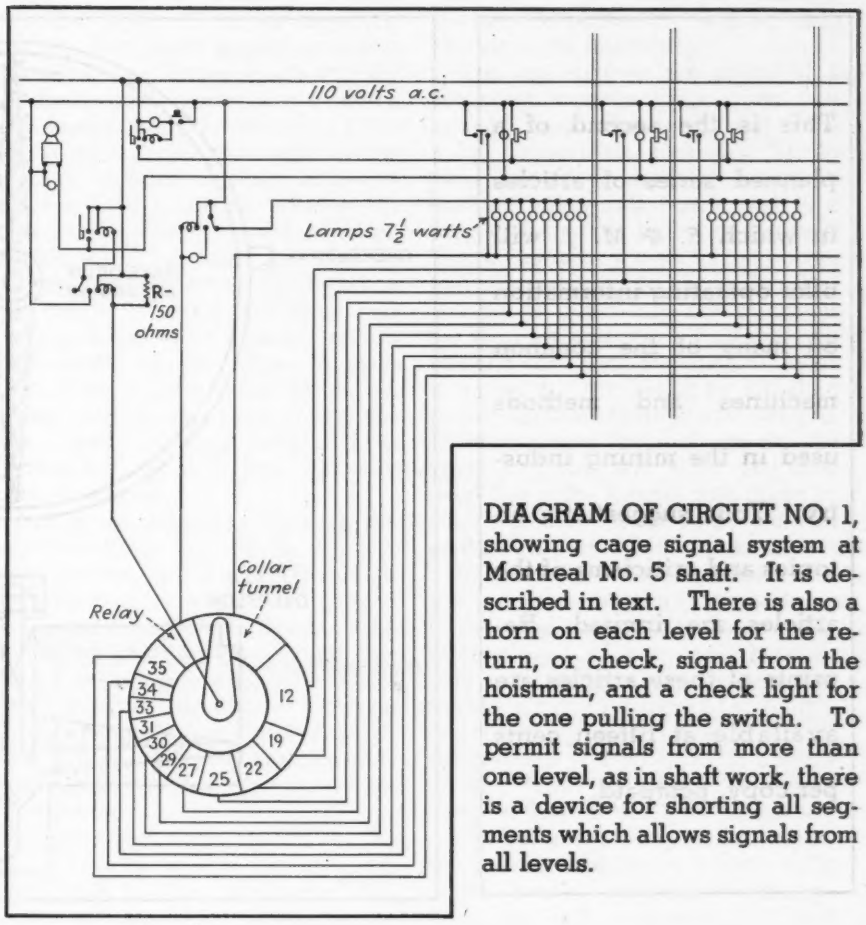
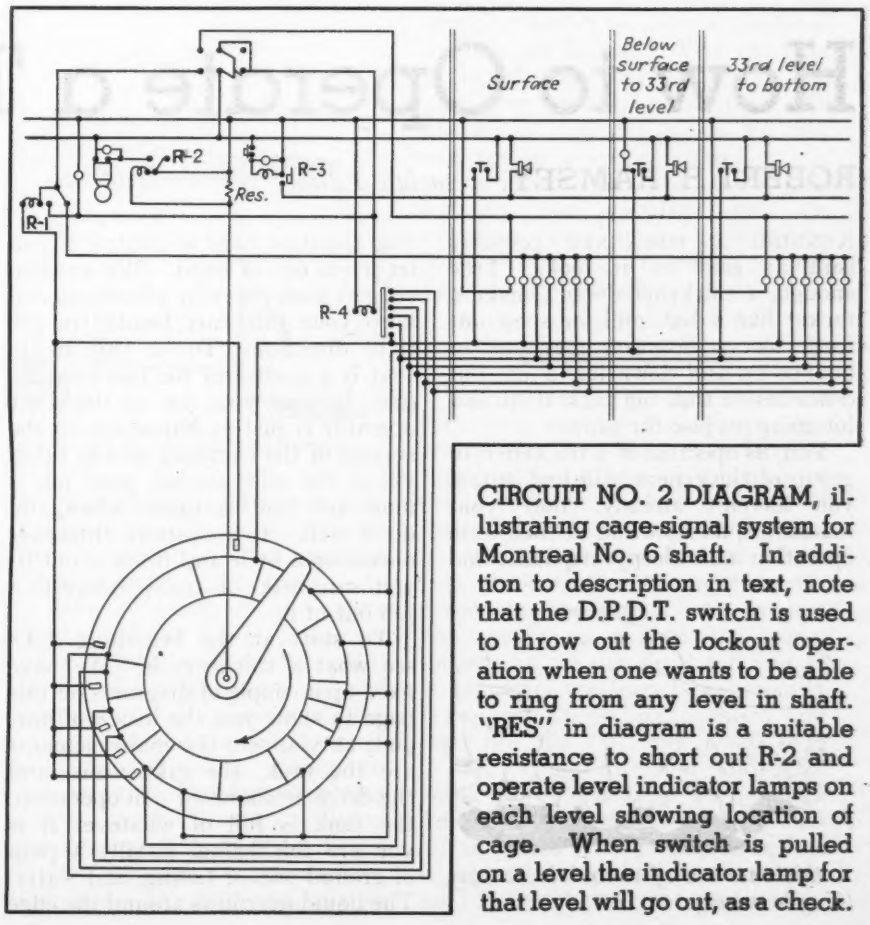
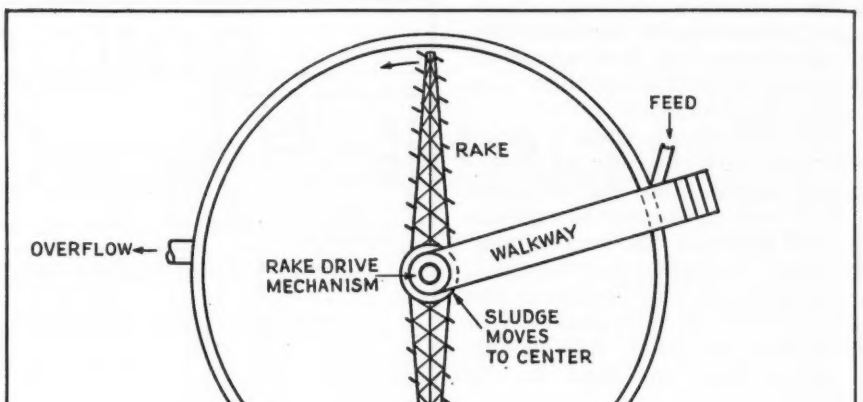


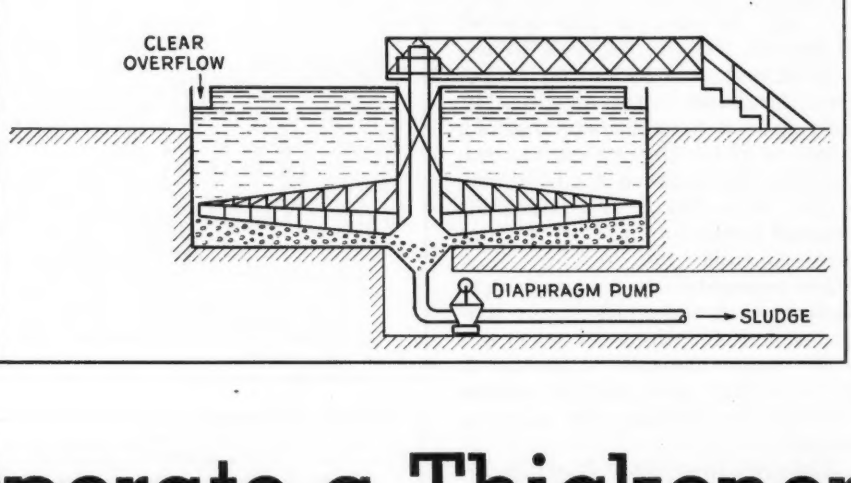
DIAGRAM OF CIRCUIT NO. 1, showing cage signal system at Montreal No. 5 shaft. It is described in text. There is also a horn on each level for the return, or check, signal from the hoistman, and a check light for the one pulling the switch. To permit signals from more than one level, as in shaft work, there is a device for shorting all segments which allows signals from all levels.



CIRCUIT NO. 2 DIAGRAM, illustrating cage-signal system for Montreal No. 6 shaft. In addition to description in text, note that the D.P.D.T. switch is used to throw out the lockout operation when one wants to be able to ring from any level in shaft. "RES" in diagram is a suitable resistance to short out R-2 and operate level indicator lamps on each level showing location of cage. When switch is pulled on a level the indicator lamp for that level will go out, as a check.

This is the second of a planned series of articles in which *E. & M. J.* will offer operating information on many of the common machines and methods used in the mining industry. Your suggestions on topics and criticisms of the articles are invited. Reprints of these articles are available at fifteen cents per copy, postpaid.



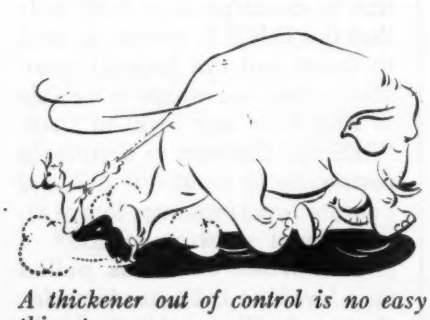


How to Operate a Thickener

ROBERT H. RAMSEY, *Associate Editor*

RUNNING A THICKENER properly isn't as easy as it looks. True enough, a thickener doesn't make a racket like a ball mill, or spew out froth like a flotation machine, or bounce up and down like a jig, but down inside that big tank there is a lot going on just the same.

You, as operator of a thickener, or group of thickeners, will find out, if you haven't already, that your machine is as slow and deliberate in operation as a sleepy elephant, and just about as hard to control if you let it get out of hand. We want to suggest some ways by which you can keep your thickener headed in the right direction. To be able to do that is a good idea for two reasons: first, because your job as thickener operator is just as important to the success of the company as any other job in the mill; second, your job is more fun and is easier when you do it well. If you study thickener operation a little and think about it, you can make a really interesting job out of it.



A thickener out of control is no easy thing to manage

To start at the beginning, let's see what a thickener is. We have fixed up a couple of diagrams on this page to show you the inside of one, and, as you see, the main elements are the tank, the rake arms, and the drive mechanism. In operation, the tank is full of whatever it is you are thickening, usually a pulp of ground ore, or tailing, and water. The liquid overflows around the edge of the tank, and the solids, also called the slime or the sludge, settle to the bottom of the tank. The rake arms go around very slowly, and the plows set on the arms gradually work the sludge over to the center of the tank bottom, along with lime sacks, old shoes, your lunch box, or anything else you drop into the tank that won't float.

The main idea in running a thickener is to get the sludge that comes out of the bottom of the tank as thick as you can, and, at the same time, keep the overflow clear. Also it is important just to keep her going, and there are times when that may not be so easy.

The purpose of a thickener is to thicken, which is simple enough, but it isn't enough for you just to know that. You also ought to know why and how this thickening is to be done. We can't tell you the whole story here, but we can give you a start on it, and then we'll ask you

to get the shift boss or the superintendent to finish the story for you.

The simplest use of a thickener in a metal-mining operation is to get water out of a pulp; for example, in a desert country where water is too valuable to be thrown away with the tailings. There you have a thickener treating the tailings and recovering some of the water to be sent back to the mill and used over again. The partially dewatered tailings are then easily stacked up. Other similar uses are to recover water from concentrates, or to cut down on the water content of a flotation feed.

In Cyaniding

Another use of thickeners is in the operation known as counter-current decantation, or C.C.D., for short. Here you have a string of thickeners that are not just recovering water, but are acting as big washing machines. In a cyanide plant, after the pulp has been treated in the agitators, the gold has dissolved in the solution and the problem is to get the solution separated from the solids, because if you lose any solution with the solids when they go out as tailing, you lose gold, too, and that isn't good business.

So you start the mixed solids and solution in at one end of a line of thickeners, and start clear weak solution in at the other end. The solids go from the bottom of one thickener to the top of the next; the solution overflows from one thickener to the next, but in the opposite direction to the way the pulp is traveling. As the solids go up the line, more and more gold-bearing solution is washed out of them by the solution which is headed down the other way. The result is that the solids that come out of the bottom of the last thickener have so little gold in them that they can be thrown away; and the solution that overflows the first thickener now has recovered a lot of gold.

If that sounds a little complicated right now, don't worry about it, but if you are in a C.C.D. plant treating gold ore, or perhaps aluminum, manganese, or nickel ore, it will pay you to study out what is going on and why. But no matter whether you are doing C.C.D. or straight thickening, remember that the main idea is still to get the sludge as thick as you can, and to keep the overflow clear.

It will help you understand what is going on in a thickener if you get a milk bottle and fill it with the thickener feed and let it stand. Notice how the slime all settles together, leaving clear liquid behind; and how the slime line comes down rapidly at first, and then slows down and finally stops altogether. Look closely at the sludge after it seems to have stopped settling, and you will see little channels twisting up through the slime. Every so often a little squirt of water will run up one of these channels, and the slime will settle a little farther. You see, liquid has to be squeezed out to make room for the slime to pack down more tightly, and this liquid pushes out along those channels. The rakes traveling around help squeeze out liquid in just that way in the thickener.

Notice the difference between the way the slimes look when you stir up the bottle, and the way they look when they are all settled and packed down in it. The first way, the slimes are settling down, and the slime line comes down in the bottle pretty rapidly; the second way, the slimes are packed up like so much mud and the slime line stays put. Here's how you can use that bit of information:

Suppose you come around to the thickener and find a lot of slime coming off in the overflow. That means you are either feeding more

How not to operate a thickener

pulp than the thickener can handle, or not pumping sludge out of the bottom fast enough. But how can you tell which? One quick way is to take a sample of the pump discharge. If the sludge is thicker than the boss has told you to hold it at, you should pump faster and pull it down. But if the slime level does not drop down, then the tonnage must be cut and quick. Going still further, you may find that even with a dilute pump discharge slimes continue to overflow, and this means that you have run into a bad-settling ore. All that you can do now is to cut tonnage. Cutting tonnage increases the settling area per ton to be handled.

You can explore the inside of a thickener some evening when you haven't much else to do and learn a lot about what goes on. To do this, fix up a sampler which is nothing but a milk bottle tied to a long stick marked in inches and feet. There has to be a cork in the bottle, and a string tied to the cork. Put the bottle down into the thickener as deep as you want it, then pull out the cork with the string. Wait a second for the bottle to fill, then pull it up, and there's your sample. Then measure the distance on the stick, and this will show you how deep down the sample was taken in the thickener. In this way you can explore all parts of the thickener.

In general, the best indicator to tell you how the thickener is doing is the condition of the sludge being pumped out of the tank bottom. You will undoubtedly be required to take regular samples of the sludge, and probably record the weight of the samples you take, but it doesn't do any harm to take a few more samples just to see how things are going. A great many skillful operators take samples in a pint milk bottle (Doesn't anybody drink anything but milk around here?), and they can tell by looking at the sample whether or not the thickener is "on the beam." You can't be expected to do that right away, but you may be able to in time. Of course, if you are made to take samples in a special container and weigh them on a special pulp balance, you probably won't develop an "eye" for it, because you won't have to. It won't do any harm to try, though.

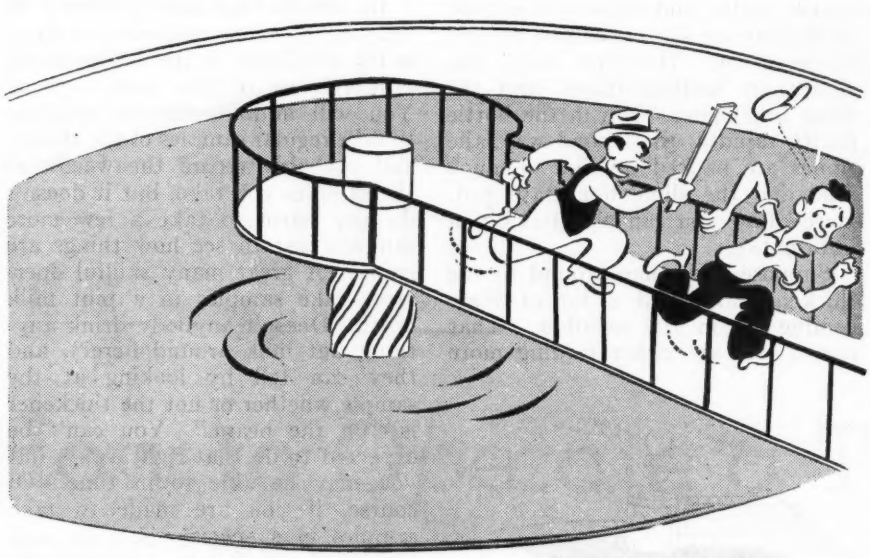
Follow Orders

In any case, the shift boss will start you out by showing you, or telling you, how thick the sludge is supposed to be, and all you have to do is to keep it that way. If it gets thinner than it ought to be, slow up the diaphragm pump. If it gets thicker than it ought to be, speed up the pump. As to just how much to change the pump setting, all we can do is tell you to go easy until you learn by experience. If you shift the setting too much, you may run the thickener away over in the wrong direction and then you'll have to coax it back again. This sort of see-saw operation is bad for any piece of mill equipment, but it is particularly bad in thickeners used in counter-current decantation

work. Handling flotation machine upsets is child's play by comparison, because the thickeners take so long to make up their minds.

What happens if you do let the thickener underflow (the sludge) run too thin? If it is a tailings thickener, you are wasting water, which is unforgiveable in the desert. If it is a concentrate thickener, you may be handing the filter operator a headache, which he may return with interest. If it is a C.C.D. thickener, you are only making trouble for yourself farther along the line.

Suppose you let the thickener underflow run too thick—what then? You may cause the overflow to become slimy, for one thing, but the big danger is that you may overload the thickener. It was built to handle just so much sludge, and if you crowd it beyond that point, you are in for trouble.



A difficult thing to explain—that barber-pole effect

This brings us to the most important indicator of thickener operation, the overload alarm. There is a spring arrangement attached to the drive mechanism up on top in such a way that when the arms begin plowing into sludge more than they were meant to, the spring pulls over a pointer on a scale put up where you can see it. The tougher the going, the more the pointer comes over; until finally a bell rings to warn you to get busy and do something about the overload. If you should leave things alone after that, the pointer moves a little farther, closes a contact, and shuts the thickener down. The fat is now really in the fire. The rake arms are buried in mud, and the feed will have to be cut until the thickener has been unloaded. When unloaded, the arms have to be raised until the thickener mechanism will again turn. Following this, the pump must be speeded up to help draw down the sludge load as fast as possible. While this is going on, the thickener arms must be lowered slowly until they finally reach their normal operation location. And then after you have done probably more than your share of this dirty job, you will be hauled up on the carpet to explain where you were when the bell rang.

And yet there have been thickener operators who stuffed paper in these warning bells because they didn't like to be startled out of a sound sleep by loud ringing noises. Just remember that that pointer and the bell are there for a purpose, and that when they indicate an overload, the chances are about 100,000 to 1 that the thickener really is overloaded. You will save yourself an awful lot of trouble by paying attention to these warnings.

For those people who are still operating one of the old-style-hair-on-the-chest belt-driven thickeners, let us add this warning: If your thickener bogs down, there isn't any fancy cut-out switch, and you may be tempted to start the thickener by main strength. You slap on belt dressing, maybe you even tighten the belt, and give it everything you've got. Sure enough, you may get the central shaft to turning, but the rake arms won't turn. You will discover before long that your strong-arm stuff has turned the central shaft into a poor imitation of a barber pole, which is a very difficult thing to explain away.

What to do when the pointer begins to show an overload? Look at the discharge to see whether or not you are "over-thickening," which means pumping sludge too slowly. Also, run a pole down into the thickener over near the center of the tank. You can tell by the feel when the end of the pole reaches the layer of thick sludge. This thick layer ought to be about two feet thick—not much more and not much less. In case of overload, it will probably be more, and you can cut it down by pumping faster. If the slimes are away up, you may be feeding too fast.

In the case of the belt-driven thickener with the stuck rakes, the thing to do is to raise the rakes until they clear the sludge. Instead of slapping on the dope, run them around by hand a complete revolution to make sure they are clear; then start up again, gradually lowering the rakes every hour or so until you work the load off. Never stop the diaphragm pump when the thickener cuts out or gets stuck. If anything, hurry it along.

A Few Other Points

The foregoing are the main items to remember in thickener operation, but there are a few other points worth mentioning. For example, there is this matter of dropping things into the tank. It is a safe bet that there would have been no tool shortage at the beginning of the war if all the thickeners in the country could have been drained and the "lost" tools recovered from them. And what is worse, a tool may be shoved by the rakes over into the center of the tank bottom, where it will jam the outlet and perhaps choke off the sludge. Digging it out is the only remedy, unless you can fish it out; so the moral is, hang onto your pipe wrenches when you work near a thickener.

In a really big thickener, it is sometimes difficult to tell if the arms are moving. Not just for that reason, but because it is a pretty good idea anyway, some companies have had their men fasten a thin pole in an upright position to the end of one rake arm. This pole should be long enough to reach the surface of the water, and on top of the pole is fastened a red ball, a decoy duck, a model of the "Queen Mary," or whatever you like. Then as the arms go around, the duck goes around, too, and because it is out at the end of the arm, it swims fast enough to leave a wake.

Sometimes a "washboard" condition may develop on the thickener

bottom, just as it does on some gravel roads, and the "tame duck" will give this condition away instantly by beginning to travel like a porpoise. The washboard effect may sometimes be stopped by changing the speed of the arms, just as you can find a car speed that will stop the bouncing over washboard roads.

If the sludge slows down or suddenly stops coming into the pump, the pipe is probably plugged. You have no doubt already been shown how to blow air and water through the pipes to clear them. If the pipe doesn't seem to be plugged, there may have been a "snowslide" of pulp over into the center of the tank, and you may have been the victim of island formation. Islands are big collections of sludge that ride around on the rake arms and refuse to be scraped out of the tank. You can tell by sounding with a pole whether you have a snowslide or an island, and if it is a slide, treat it like an overload. If it is an island, try to break it up by shoving a water jet down into the center of it.

Just a word about thick pulps. Don't be afraid that a thick pulp will plug up the diaphragm pump or the sludge lines. Actually a thin pulp will plug the line much quicker than a thick pulp will, the

A "tame duck" can help

reason being that sand settles out of a thin pulp faster than it does out of a thick one. If you try to pump a thin pulp from a thickener, sand may settle out and plug the pipe lines.

This may seem to be rather late in the game to tell you how to start a thickener, but we do want to get it in. Don't start a nice clean thickener by filling it with fresh water and then running in pulp. If you do, the chances are that sand will settle out so fast in the clear water that it will bury the rakes before they do any raking, and you are licked before you start.

The thing to do is start the arms going with the thickener empty, then run in pulp, and let the thickener fill up with it. Run the diaphragm pump slowly for as long as is necessary to bed the thickener down with a couple of feet of thick sludge, then bring the pump up to what seems to be the proper speed for steady operation.

Now for a few mechanical details, and that will be all. Keep all the bolts tight around the drive mechanism, and clean regularly the screen on the feed launder so that wood chips don't get into the tank. Waterlogged wood helps form islands. Sluice out the sludge line once a week, and test the overload alarm daily. Keep the worm chamber on the drive mechanism full of oil, and take care of the grease fittings daily. The lifting screw gear ought to be greased well, and it is a good idea to keep grease on the central shaft for about a foot below the worm gear. And don't fall into the thickener; it doesn't look well.

This article is based largely on information furnished by C. K. McArthur, of The Dorr Co., Inc., New York, N. Y., and further information and suggestions were furnished by H. L. Hazen and Wayne C. Hazen, of Manganese Ore Co., Boulder City, Nev. Their assistance is gratefully acknowledged.

Iron Ore Output Down Slightly in 1943

DOMESTIC OUTPUT of crude iron ore in the United States in 1943 totaled 119,674,980 gross tons, according to the Bureau of Mines, coming from 287 mines, 25 of which mined over 1,000,000 tons each. This is a 4 percent drop compared with 1942. The total is broken down by kinds of ore and producing districts in the table below. The amount beneficiated in 1943 is set forth, in gross tons, at the right. Ore containing 5 percent or more of manganese is excluded.

DOMESTIC IRON ORE BENEFICIATED IN UNITED STATES, 1943

Year	*Beneficiated*	*Total Shipped*	*Percent of Total*
1925-29 (ave.)	8,653,590	66,697,126	13.0
1939	9,425,809	54,827,100	17.2
1940	12,925,741	75,198,084	17.2
1941	19,376,120	93,053,994	20.8
1942	23,104,945 *a*	105,313,653 *a*	21.9
1943	20,117,685 *a*	98,817,470 *a*	20.4

a Includes ore for paint.

DOMESTIC IRON ORE PRODUCTION IN UNITED STATES, 1943

Variety of ore	*Lake Superior District*	*Birmingham*	*Chattanooga*	*Adirondack and Cornwall*	*New Jersey and S.E. New York*	*Other*	*Total*
Crude ore:							
Hematite	95,586,789	7,339,703	2,430	.....	.....	1,508,022	104,436,944
Brown ore	.....	1,762,200	2,503,034	.....	.....	2,861,348	7,126,582
Magnetite	.....	.....	.....	5,754,463	1,263,537	1,092,837	8,110,837
Carbonate	.....	.....	.....	.....	.....	617	617
	95,586,789	9,101,903	2,505,464	5,754,463	1,263,537	5,462,824	119,674,980

Alcan Highway a Potential Aid to Prospecting

L. O. THOMAS, *Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada*

Little factual evidence existing on which to gage the mineral possibilities of areas in Canada along the Alcan Highway, circumstantial evidence has been largely resorted to in making this appraisal of them.

In the first place, the Highway traverses parts of two distinctive physiographic divisions of Canada —the Cordillera and the Interior Plains. The Canadian Cordillera is pre-eminently a mining region like its counterpart in the United States. In its course across it, the Highway is penetrated by two great batholiths of granite and granodiorite—the central cores of the Coast Range and Cassiar-Omineca systems of mountains. The intruded rocks along the flanks of these batholiths are particularly favorable areas for prospecting. Between the batholiths lies a partly mountainous Plateau belt occupied in the main by quartzites, schists and their gneissic phases, and bodies of granite gneiss. Throughout this belt and the Cordilleran region in general one can expect to find any of the minerals that occur in association with igneous rocks, especially metalliferous deposits of gold, silver, lead, zinc, and copper.

The Rocky Mountains system constitutes the eastern boundary of the Cordillera. Mainly made up of folded and faulted sediments, predominantly limestone, of Palaeozoic and Mesozoic age, it is not likely to contain any large deposits of metallic minerals. The Interior Plains region east of it abuts in places upon the Cordilleran, but elsewhere a narrow belt of high ridges—the foothills—intervenes. As both it and the foothills are underlain chiefly by sedimentary rocks, the economically valuable minerals to be expected are those that form sedimentary beds or originate from them. They include non-metallic minerals and the fuels, coal, gas, and petroleum.

Such, then, in brief, is the geological outline of the country over which the Highway passes. Only a very small fraction of the country is known in detail. This is readily understandable when one considers that until lately much of the region was so difficult of access that the scope for its economic development was strictly limited.

TRANSPORTATION FACILITIES at low cost are fundamental to the economic development of the remote region which the Alcan Highway traverses in Canada. The Highway and its branches should contribute much to this end. Inasmuch as they are located on or near airlines served with airports, flight strips, emergency landing fields, gasoline pipe-lines connecting strategic points to Skagway, and crude oil piped 577 miles from the MacKenzie River to Whitehorse for refinement, air-borne freight at low rates becomes a possibility. Flying is commonplace, making the North available in hours instead of the months which were often necessary before the advent of the plane. It mitigates the handicaps of the short summer season and of the tedium and difficulties of mountain travel to which the prospector is subject in northern latitudes. The waterways, roads, and trails that have been improved for transportation are a further aid in this respect as well as a spur to lower freight rates.

Until recently, however, the prospector was compelled to confine his attention more or less to those parts of the country through which the Highway now passes that could be reached from the White Pass and Yukon railway or from the main waterways or the roads and trails that originated in the days of the early fur traders or the Klondike "gold rush" of '98. Heavy freighting costs precluded bringing in equipment and supplies for extensive development work and made shipments of ore unprofitable unless it was exceptionally high in grade Consequently, as there was little inducement to search for minerals other than placer gold, many of the prospectors who entered the country were neither interested nor experienced in the search for lode deposits. Even so, lode deposits have been discovered. They, as well as placers, are summarily reviewed under the sections of the Highway that are to be dealt with here. That which follows should be read in the light of these remarks. It will be readily seen why the present mineral output of the area consists almost solely of small quantities of placer gold.

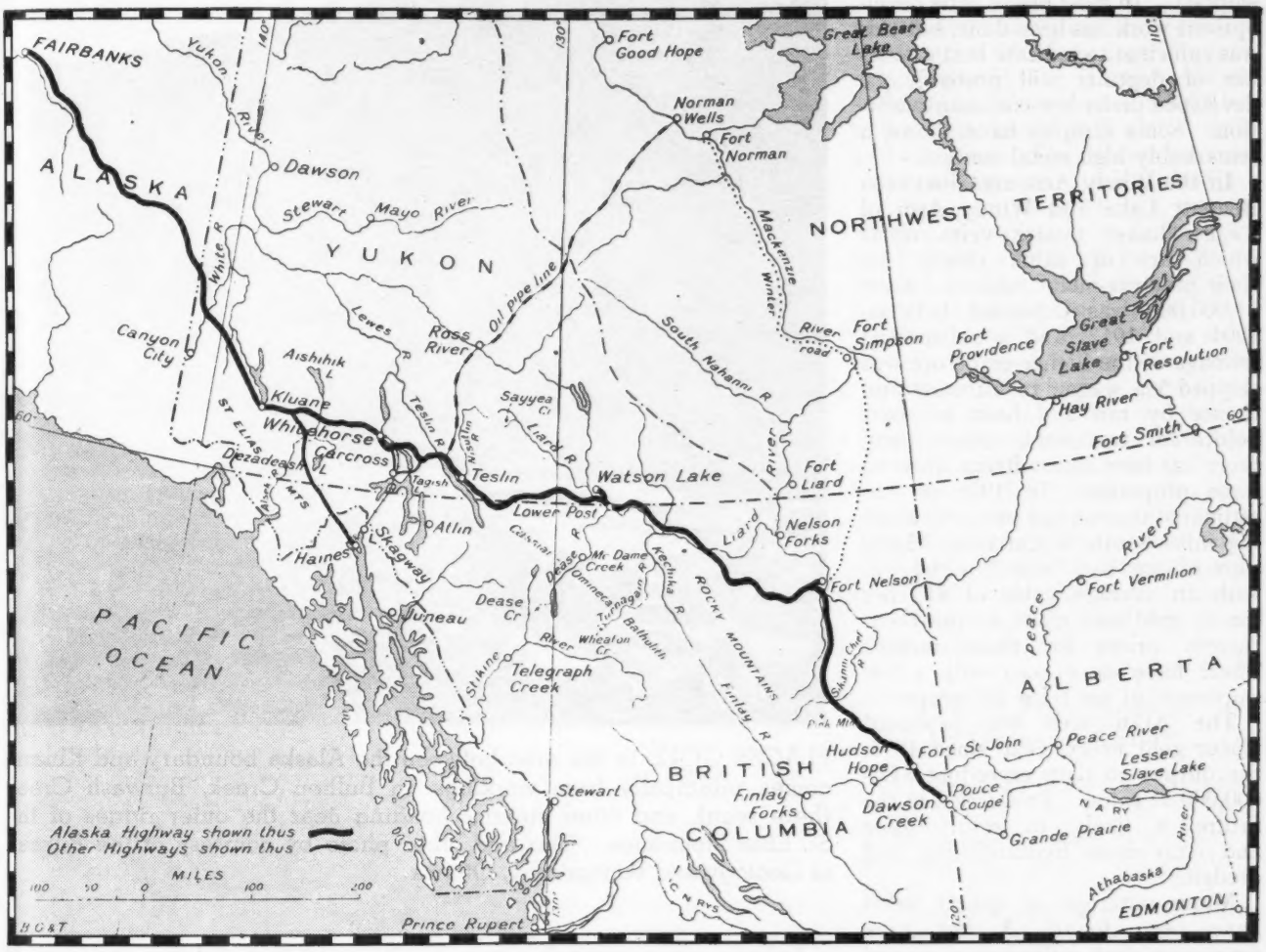
Along the Highway

From the Alaska boundary to Kluane the Highway lies between the St. Elias and Coast ranges, in the former of which are many snow-capped peaks 10,000 ft. or more above sea level. Between White River and Kluane Lake the geology has largely to be determined, particularly on the north side of the Highway, where the Coast Range batholith is likely to be found continuing northwesterly.

Copper, chiefly as bornite, occurs northward from Burwash Creek along the east side of its tributary, Tetamagouche Creek. Though none of the known occurrences is sufficiently extensive or persistent to provide any large amount of merchantable ore, some workable deposits may yet be found, as copper mineralization is prevalent here.

Native copper appears to be widely distributed, especially in the rocks along the St. Elias Range. Near

Written for Engineering and Mining Journal and published by permission of the Director, Mines and Geology Branch, Ottawa.



THE ALCAN HIGHWAY stretches from Dawson Creek in eastern British Columbia, 1,582 miles to a point on the Richardson Highway, in Alaska, 88 miles from Fairbanks. Attention here is directed to the mining areas adjacent to it in Canada. Those in Alaska will be discussed in another article soon.

Canyon City, on White River, slabs of the metal weighing several pounds have been secured; one exceptionally large mass was estimated to weigh 3 tons. But unless primary sulphides are found in sufficient concentration to merit exploitation, the quantity of merchantable ore obtainable from the occasional masses of native copper at the surface is likely to be too limited and uncertain.

Placer gold is recovered mainly from streams heading near the outer ridges of the St. Elias Range, notably Bullion and Burwash creeks.

From Kluane to Whitehorse

Between Kluane and Whitehorse is a fairly well-mapped part of Yukon, which has been neglected by the prospector because the main valleys are heavily glaciated and no sizable gold placers have been found to arouse his interest. Small placers occur in waters of the Alsek and Diezadeash River systems, notably Ruby and Fourth of July creeks, as well as elsewhere along the southwest flank of the Coast Range batholith, which is crossed by the Highway. The Highway also crosses the northern extension of the Whitehorse copper belt. This belt contains contact-metamorphic orebodies in which copper minerals are associated with magnetite or hematite or silicates.

Copper production began in 1900 with a shipment of 9 tons of ore containing 46.40 percent of copper and continued intermittently until 1930. In all, ore to the value of $2,712,000 was shipped. By far the greater part came from the Pueblo copper-hematite property, which operated at a heavy loss, however, because of high costs for pumping, timbering, and freight. In 1907 it was estimated that 500,000 tons of ore was in sight in the belt, since which time less than 100,000 tons of ore has been shipped, and new orebodies have been discovered.

North of the Highway, in the Aishihik Lake district, copper deposits, also of the contact-metamorphic type, occur on Giltana Lake. Ore zones, averaging 6 to 10 ft. in width, have been traced for distances of 50 to 200 ft. Assays range from 1.35 to 9 percent copper.

From Whitehorse to Teslin

One of the most easily accessible parts of Yukon is here traversed, yet it is largely unprospected. In the Teslin-Nisutlin rivers area about fifteen creeks are known to be gold-bearing, but no important "strike" has been made. Veins carrying silver and lead, others silver and copper, also occur, on some of which a little development work has been done.

From Carcross, access is had to the Wheaton River and Windy Arm areas of Yukon as well as the Atlin Lake region of British Columbia. Near Wheaton River, gold-silver, antimony-silver, silver-lead, and contact-metamorphic copper deposits occur. No ore, however, except a small amount for testing, has been

shipped. In most places little development work has been done, but this was sufficient to indicate that a number of deposits will probably be developed under low-cost transportation. Some samples have shown a remarkably high metal content.

In the Windy Arm area (between Bennett Lake and Windy Arm of Tagish Lake) quartz veins occur which are of value chiefly for their precious-metal content. Over $1,000,000 was expended between 1904 and 1912, and a substantial tonnage of the higher-grade ore was shipped via wagon to Carcross and thence by rail and boat to coast points for treatment. Since then, there has been intermittent work on some properties. In 1916 it was estimated that on one property alone (5½ miles south of Carcross) 75,000 tons of ore had been blocked out with an average value of $15 per ton in gold and silver at the then-current prices for those metals. There have since been only a few shipments of ore from the property.

The Atlin area has produced placer gold every year since 1898, the output to date exceeding $12,000,000 in value. Production in the future is likely to result more and more from hydraulicking and dredging.

Many outcrops of quartz veins have been found. A few were developed, test mills being erected and shipments made of selected ore. The Engineer mine, on Tagish Lake, whose very rich showings aroused considerable interest, produced 17,418 oz. of gold before being forced to close when efforts at large-scale development failed owing to the insufficiency of the high-grade ore to justify them. The remarkable richness of the narrower veins should make small-scale selective mining profitable. Further exploration of the veins at depth is warranted. Gold-silver quartz veins at a number of points merit further examination, and a more intensive search for lode-gold around Surprise Lake is advisable in view of the many placer streams there and the occasional gold nuggets recovered.

Silver-lead deposits occur on Leonard Mountain, near Atlin, in an intrusive body considered to be one of the outlying masses of the Coast Range batholith. Smelter returns covering 10½ tons of ore shipped in 1924 from the Ruffner property showed: 0.11 oz. gold per ton, 193.95 oz. silver per ton, 7.70 percent lead, and 3.10 percent zinc. Development had been encouraging, but commercial oreshoots had yet to be found.

PLACER GOLD in the area between the Alaska boundary and Kluane comes principally from workings on Bullion Creek, Burwash Creek (here seen), and other streams heading near the outer ridges of the St. Elias Mountains. This and other photo by courtesy of the Bureau of Geology and Topography, Ottawa.

Native copper occurs in veins on Copper Island, in Atlin Lake, but not in economic quantity. It may be found more plentifully elsewhere, as it is probably distributed throughout a basaltic belt extending from the south end of Atlin Lake to Edgar Lake. Copper deposits of the contact-metamorphic type occur in the valley of Hoboe Creek, and work on them has indicated fair ore in places.

Among other known minerals are wolframite, at the head of Boulder Creek (which flows into Surprise Lake) and hydromagnesite, close to Atlin. Ore shipped in 1942–43 for testing the first-mentioned occurrence assayed over 14 percent WO_3. The deposits of hydromagnesite have been estimated to contain over 100,000 tons of good white material averaging between 41 and 42 percent MgO. Some 800 tons were shipped prior to 1915, but freight and other costs, presumably, proved too great an obstacle to financial success.

From Teslin to Watson Lake

A geological reconnaissance in 1943 between these points revealed that the Cassiar-Omineca batholith crosses the Highway between 87 and 103 miles east of Teslin and extends beyond the oil pipe-line between Whitehorse and Norman Wells. Other evidence indicated that there are at least 20,000 sq.mi. astride this stretch of the Highway that merit close prospecting. The finding last year of silver, lead, zinc, copper, tungsten, and other mineral occurrences, though none could be considered commercial, is encouraging.

In 1943, also, the hitherto little-known region between Teslin and the upper reaches of Cottonwood River in the Dease River area was examined and mapped.

North of the Highway, placer gold has been secured from bars on the Liard and from Sayyea and other creeks near its headwaters, where two companies explored in 1933 and 1934 and reported the presence of sizable areas of gold-bearing gravels but concluded that mining would prove too costly in so undeveloped an area.

South of the Highway is the Cassiar area, which is credited with $5,000,000 worth of placer gold, of which $4,000,000 was produced in the seventies. The bulk came from Dease, Thibert, and McDame creeks. After 1895, however, by which year the output was negligible, interest in

the area flagged until 1924, when gold was found in Goldpan Creek on the east side of Dease Lake. To date two to three thousand ounces of coarse gold, with nuggets weighing up to about 2 oz., have been recovered from that creek.

In 1932, coarse gold was recovered farther east, from Wheaton Creek (now reached from Dease Lake by a tractor road). A gold nugget weighing 52.75 oz. and numerous others up to 16 oz. were later obtained from its tributary, Alice Shea. In 1938, a small area of pay gravel in a bench yielded $12,000. During the period 1935–39, crude gold to the amount of 4,582 oz. was produced, nearly all from three leases, two on Wheaton Creek and one on Alice Shea Creek.

The lode-gold possibilities of the Cassiar area were first recognized when a ton of quartz containing 4 oz. of gold was flown out in 1924. It was secured at the head of McDame Creek. The highest content of gold in samples of exposed mineralized quartz collected in 1935 was 1.40 oz. per ton; many samples, however, held only traces of gold and silver.

On Table Mountain, near McDame Lake, a vein was traced for 3,400 ft. Its width averaged 4.9 ft. Assays of samples taken across it at a number of surface workings showed, per ton: gold, nil to 2.20 oz.; silver, nil to 3.5 oz. In a 10-ton mill installed in 1939 on this mountain, 50 tons of ore had been treated, with a recovery of 60 oz. of gold, when litigation suspended operations.

Other evidence of the mineral possibilities in these largely unprospected areas—which can be reached from the Highway via Dease River—lies in the presence of platinum in Thibert Creek, ankerite-mariposite rocks and float boulders of chromite in Wheaton Creek and vicinity, quartz veins in many localities, high-bench old-channel grounds, coarse stream-gold (which suggests proximity to its source), and sections of formerly productive placer-creeks favorable for hydraulicking and for mining, in places, the bedrock.

From Watson Lake to Fort Nelson

Apart, largely, from McConnell's account of his exploratory journey down the Liard River, 1888–89, little information is available about this part of the Highway. In 1943 a reconnaissance was made from Fort Nelson down the river of that name to the Liard, up the Liard to Hell Gate, and also up Beaver River for a distance of 50 miles. The entire area covered was found to be underlain by sedimentary rocks. Reconnaissances were also made or begun, that year, for the purpose of finding structures favorable for the accumulation of oil.

The ranges of the Rockies have been but little explored. North of Terminus Mountain they decline in elevation and virtually lose their identity between it and the Liard.

Between the Cassiar-Omineca Mountains and the Rockies is the Rocky Mountain Trench, a remarkable valley extending from within the State of Montana to, and probably beyond, the Liard. Almost throughout its course in the Kechika valley it is floored with glacial drift and alluvium. The contact between the Trench and the flank of the Cassiar-Omineca ranges bends sharply abreast of Dall Lake (connected by Dall River with Turnagain River). Radial to this bend the country ought to prove good prospecting ground, since there is in it a great variety of rock types and structures.

Placer gold has been recovered from Walker Creek, a small stream flowing into Deadwood Lake, and from bars on Liard and Kechika rivers.

A deposit of chalcopyrite in ankerite and quartz across widths as great as 40 ft. and traceable for 2,000 ft. was reportedly discovered in 1940 in Hidden Valley Creek, a tributary of Turnagain River between Mosquito and Sand creeks.

From Fort Nelson to Dawson Creek

As the rocks in this largely unexplored section are almost all sedimentary and of Cretaceous age, only non-metallic minerals are likely to be found.

Large coal areas occur. Deposits in which the coals vary from bituminous to semi-bituminous lie on either side of Peace River Canyon, a few miles west of Hudson Hope. The Carbon Creek-Pine River area has equally great potentialities as a coal field. From both of these areas, however, only a small tonnage is produced at present, mostly for consumption in Dawson Creek.

Favorable structures for the production of oil or gas are known, and many others undoubtedly occur in the foothills east of the Rockies. They differ from their counterparts in southern Alberta in that the folds are very gentle in front of the more westerly faulted anticlines—a fact of much significance in the search for promising drilling areas.

Some 40,000 sq.mi. of possible oil-bearing territory is penetrated by the Alaska Highway in northeastern British Columbia. A strip of country north of Beatton and Halfway rivers and near the Highway was mapped during 1943. In it several anticlines to the east and north of Pink Mountain were observed.

Testing of structures by drilling has yet to prove the presence of oil in commercial quantity. Tests in the Pouce Coupé area indicate that it is a source of natural gas rather than of petroleum.

QUARTZ CREEK, at the head of McDame Creek, near the scene of the lode-gold discovery made in the Cassiar area. This yielded some high-grade ore which was flown out in 1924.

Grading mica in the North Carolina shop of Colonial Mica Corporation.

The Wartime Problem of Mica Supply

Premium prices and technical assistance have expanded domestic production of strategic mica fourfold and increased supplies from foreign sources

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MICA HAS IMPORTANCE in the war program far greater than its comparative size, measured either by weight or value. In ordinary times the mica industry does a volume of only a few million dollars a year.

Even before the war it was realized that mica would be one of the critical war materials, and in 1940 arrangements were made for building a government stockpile. Gaged in terms of peacetime requirements, this stockpile was of considerable size, but as estimates of mica requirements began to be compiled early in 1942, it was apparent that the stockpile would provide for only a small fraction of our annual consumption.

Foreign Procurement

Accordingly, early in 1942 the War Production Board, for the U.S., and the Ministry of Supply, for the United Kingdom, laid plans for stimulating a world production sufficiently large to meet war requirements. It was decided that the importance of mica required that its procurement be a government affair. To the British Ministry of Supply was assigned the responsibility for obtaining maximum production of mica in India and to the U.S. the responsibility for obtaining maximum supplies from Brazil and other Western Hemisphere countries, including our own domestic resources.

From the early days of the electrical industry, India has been the principal world source of supply for mica, and even with the important production increases achieved from other sources, India today still furnishes about 60 percent of the sup-

plies available to United Kingdom and the U.S. For the purpose of purchasing the entire India production and stimulating production to the highest possible level, there was set up the Joint Mica Mission in India under the control of the Ministry of Supply, but consisting of three U.K. members and three U.S. members. The Joint Mica Mission has been successful in improving India production of mica in the face of many obstacles over which it had no control, such as shortages of labor, food and fuel, difficulties of transport, and the apathy of the native population.

Good Yield from Brazil

The Brazilian mica program was first set up as a responsibility of Metals Reserve Company, which organized the U.S. Purchasing Commission in Rio de Janeiro to encourage the production of and undertake the purchase of mica and other strategic minerals obtained in Brazil. The U.S. Purchasing Commission was transferred to the control of Foreign Economic Administration in 1943. An extensive program of prospecting and technical assistance to mica producers and processors was undertaken. Before the government program in Brazil was started, nearly all Brazilian mica was marketed in mixed qualities. It was decided that the U.S. Purchasing Commission would buy only properly qualified mica—that is, mica not only graded to size but sorted into the commercial qualities which had been developed in the India trade. This meant an extensive program of education and training of the dealers. Consequently some six months elapsed before results were obtained and volume of government purchasing came up to the level of past private volume.

Production of the better qualities of mica in Brazil from 1944 to date represents by far the highest level of production that country has ever achieved. However, some fear is expressed that procurement has been running considerably ahead of actual mining and that ore reserves are being depleted at a rate considerably in excess of the development of new deposits.

In both the Indian and the Brazilian programs it was realized that attractive prices were required to increase mica production. Although the prices originally established in both countries were on a higher level than those previously prevailing under private sale and purchase, it has been found necessary to grant additional price increases in both countries to compensate for the increases in the cost of mining which have developed during the past two years.

Lower Qualities Purchased

Practically every mica mine produces a range of qualities of mica as well as a range of sizes. Also, in most mines poorer qualities predominate. In peacetime this does not represent any particular problem, because the bulk of the demand is for the lower qualities, which are used principally as insulation in electric appliances, such as flatirons and toasters. Under wartime conditions the requirements are topsy-turvy, demand being strongly concentrated in the higher qualities, which are used for radio and radar capacitors, vacuum tubes, aircraft magnetos, and spark plugs. These items make up about 90 percent of our total mica requirements. Thus, to obtain the necessary quantities of the higher qualities of mica, large amounts of lower qualities must also be produced. These lower qualities must also be sold by producers if they are to continue in operation. As a general policy, it was preferable for the various mica programs to include the purchase of the quantities of lower-quality mica that were necessarily produced, along with the needed better qualities. If the better qualities alone were purchased, much higher prices would have had to be paid for them alone. However, unless a mine produced a reasonable proportion of the desired better qualities, its entire production of poorer qualities would not be purchased.

The Domestic Program

During the time that the India and Brazilian procurement programs were being set up in early 1942, plans were also formulated for a domestic production program. This was much more difficult to establish than the foreign programs, because additional factors were involved. Many of our domestic deposits are as rich as regards the percentage of mine-run mica as the mines in India and Brazil. Furthermore, the yield of finished full-trimmed and qualified mica from domestic deposits compares favorably with that of Indian and Brazilian deposits. However, the much higher wage scales in this country compared with those paid in India and Brazil precluded possibility of domestic production at the same cost as foreign production. Considerably higher prices would have to be paid for domestic mica. Merely to pay higher prices, however, alone would not achieve the desired results. It would be necessary to furnish equipment to mica mines, to furnish technical assistance in their operation, because men with little or no mining experience would have to be brought into the industry, and to furnish assistance and training in proper methods of processing mine-run mica into the commercial form of full-trimmed block or sheet mica required by the trade.

The W.P.B. in the early part of 1942 formulated a comprehensive program for domestic mica production which took these factors into consideration. This program was assigned to Metals Reserve, which organized the Colonial Mica Corp. as its agency for this purpose. The W.P.B. decided that the domestic program would best succeed if an established name in the mica industry were taken over to operate this program. The Colonial Mica Co. was a small, custom fabricating plant. Arrangements were entered into to wind up its fabricating business and turn the company over to Metals Reserve to act as its agent for carrying out the domestic mica program.

Premium Prices Paid

Inasmuch as there was no precedent for the conduct of Colonial Mica Corp., much of its policy had to be worked out by trial and error. The first concrete accomplishment of Colonial was to announce a buying price schedule for domestic mica in June 1942, but as its field organization was not completed, it was unable to undertake actual buying operations itself at that time, and the price schedule announced was followed by private buyers. This price scale was based on what was called, for lack of a better name, standard North Carolina preparation. This meant mica in approximately half-trimmed condition—that is, the sheets were partly knife-trimmed only, and had some rough or natural edges remaining. As an indication of the initial price increase provided to domestic miners, it can be pointed out that the June 1942 Colonial price schedule provided for a price of $1.10 per pound for mica sheets of Grade 1½x2 in. Immediately prior to the announcement of this price schedule, this same size of mica had been selling at about 65¢. per pound and as recently as March 1942 for 45¢. per pound.

A few months later it became

PRICES PAID FOR DOMESTIC MICA

	Private Purchases		*Colonial Mica Corp. Schedules*	
	Dec. 1941	*April–May 1942*	*June, 1942*	*Nov. 1942*
Size	Per Pound	Per Pound	Per Pound	Per Pound
Punch	$0.10–$0.15	$0.12–$0.16	$0.22	$0.30
1½ x 2	0.45– 0.65	0.50– 0.65	1.10	2.40
2 x 2	0.60– 0.85	0.95– 1.10	1.75	3.52
2 x 3	1.30– 1.50	1.50– 1.85	2.75	4.64
3 x 3	1.90– 2.05	2.00– 2.35	3.50	5.12
3 x 4	2.15– 2.25	2.25– 2.60	4.25	6.08
3 x 5	2.60– 2.75	2.75– 3.00	5.00	7.04
4 x 6	3.60– 3.70	3.75– 4.00	6.25	8.00
6 x 8	5.25– 5.50	5.50– 6.00	8.00	9.12

apparent that the existing price scale was insufficient to obtain as large an increase in domestic production as was desired, and in November 1942 a further price increase was announced by Colonial.

It should be noted that the price increase of November 1942 over June was not so great as the figures in the table alone might indicate. The June price for punch mica applied to punch mica as it had been customarily marketed. The November Colonial schedule set up a definition for punch mica which required that each piece of punch mica be capable of being trimmed into Grade 6 with not more than a 5 to 1 waste—that is, a 20 percent yield. It was realized that this new definition for punch mica would considerably reduce the amount of punch mica which a miner could sell to Colonial, and a part of the price increases was intended to offset the upgrading. In addition, Colonial set up conditions in its buying price schedule to encourage better—that is, more complete—preparation of mica by mine operators by offering a bonus for improved preparation.

At the same time that Colonial announced its new buying price schedule, in November 1942, W.P.B. Mica Conservation Order (M-101) was amended so as to make Colonial the sole buyer of all strategic domestic mica. This action was merely a safeguard, as the spread between Colonial's buying and selling prices made it extremely unlikely that any mica consumer would compete with Colonial.

The One-Price Plan

Visual appraisals of mica offered to Colonial were likely to vary, as the appraisals depended greatly on the personal judgments of the Colonial buyers. To eliminate dissatisfaction over appraisals, a radical departure was decided upon. It appeared that the greatest shortages were going to be on the smallest sizes. The November 1942 price schedule operated to penalize those mines which produced principally small-size mica. Because such mines usually turned out better than average runs of quality, this situation, along with the appraisal difficulty, needed correction. It was therefore decided to offer a greater subsidy on small sizes of mica than on large sizes. This was accomplished by setting up a new buying price schedule under which a uniform price of $5 per pound was paid for all mica regardless of size and regardless of quality within the strategic range. The only distinction made between large and small mica was that the small mica derived from the trimming of punch was required to be full-trimmed, whereas the larger sizes, 1½x2 and up, were required to be only ¾ trimmed. This was called the One-Price Plan and became effective in May 1943. It largely wiped out complaints regarding the appraisal of mica, as the determination of various qualities within the strategic range and the grading for size were eliminated, and judgment of preparation was confined to much narrower limits. The desired result of stimulating a greater production of small-size mica was also achieved. This price schedule remained in effect until February 1944, when Colonial announced that a bonus of $1 per pound would be paid in addition to the $5 per pound price. More recently the period covered has been extended to Dec. 31, 1944. The selling price of domestic mica averaged about $1.60 per pound for all that had been sold up to a recent date. Average buying price for the same period was $6; thus the average domestic subsidy amounted to $4.40 per pound.

Other Assistance Given

As mentioned, it was realized that equipment would have to be furnished to mine operators. This has been an important part of the domestic mica program. In April 1944 a total of 376 mines were using equipment furnished by Colonial, either wholly or in part. In addition, 454 mines had been furnished with equipment by Colonial but were shut down because their operation was uneconomic. There were 34 operating mines equipped with machinery obtained by themselves, and an additional 379 mines operating with hand equipment. This was a total of 789 mines in operation. When this is compared with the early 1942 situation, the expansion accomplished can be realized. Fewer than 50 mica mines were producing in the early months of 1942. Most of these were in North Carolina. Mica mining in New Hampshire was a moribund industry, only two operations being carried on. There were only a few producers in other parts of the country.

The small scale of operations in mica mining is not widely realized. Only about a dozen mines in the country have been able to deliver a volume of over $5,000 per month consistently. During 1943, purchases by Colonial averaged less than $400 per mine per month. Running a mica mine is small business, and the domestic mica program has been aimed at encouraging people with scant financial resources.

It gradually became evident during the development of the domestic mica program that even with the high scale of prices offered, not enough new deposits were being opened up. Private capital was still reluctant to invest on a scale broad enough to be satisfactory to W.P.B. Accordingly, the Colonial program was enlarged to include advances to cover development expenses involved in prospecting and opening new deposits. To date about half a million dollars has been advanced to mine operators for initial development work, practically all in amounts less than $2,500 per operation. Not much money is required to open up a deposit of mica and determine whether it is worthy of operation. There is no obligation to repay these advances except out of mica produced from the property. To date over 20 percent of the sums advanced has already been repaid.

Benefits of Program

The principal reason why domestic mica had not been used prior to the war for such applications as condenser films was not attributable to inherent defects of quality in the mica itself, but rested entirely on the fact that the mica was not properly prepared for such use, and could not be under competitive conditions. Under the Colonial program, domestic mica is available to all consumers, graded and qualified to definite standards, and equal in preparation to any imported mica. It is sold to consumers at prices equivalent to those applying to the similar grade and quality of imported mica. As a result, domestic mica has been found acceptable for war uses, and has contributed a worthwhile share of our total supply.

Because prior to the government program all domestic mica was marketed in rough-trimmed or half-trimmed condition, and since then has been marketed in an increasingly more complete preparation, there can be no direct comparison concerning the poundage reported produced in prewar years and during the government program. It is necessary to use certain factors to compare present production with prewar production, and the exact correlation must be a matter of judgment. In 1941 production of clear mica reported to the Bureau of Mines, if converted to full-trimmed preparation, amounted to approximately 190,000 lb. In 1942 this increased to 260,000 lb., and for 1943 to 740,000 lb. These figures take in only mica reported to the Bureau of Mines as "clear," that being the equivalent of what is considered as strategic quality under WPB Conservation Order M-101. This shows a substantial increase under the government program.

Postwar Domestic Outlook

This story would not be complete without some speculation as to the postwar future of the domestic mica-mining industry. It is difficult to hold out much hope for a continuation of mica mining on anything like the present scale unless the miner is given sufficient financial assistance to enable him to compete with imports from low-wage countries. The present tariff protection is 25 percent ad valorem, plus 4¢. per pound specific duty. In the opinion of the writers it would be necessary to increase this to a duty of several hundred percent to equal the effect of the subsidy provided by Colonial price schedules. The chances are that when the Colonial prices are withdrawn, prices will drop to such levels that domestic mica mining will revert to its prewar status.

Few new deposits of exceptional richness have been developed during the war program. Practically all production has come from already operating or reopened mines. No techniques or machinery have been devised under war pressure that have reduced the cost of mica mining. All indications point to the industry going back to prewar conditions unless government action is taken to keep it in a stronger condition. Mica mining before the war was not a profitable industry, and indeed was extremely speculative. Mica deposits are erratic in shape and size, in mica content and quality of that content. The pegmatite dikes in which mica occurs range from a 2 to 7 per cent content of mica in the pegmatite for those dikes which can be commercially operated. Then of this mine-run mica, the yield of finished full-trimmed block will range from 3 to 8 per cent. This means that from each ton of rock moved, there will result perhaps only 1 lb. of full-trimmed block mica—perhaps as much as 11 lb. Thus it will be seen that the present $6 per pound buying price means that mine operators may recover as little as $6 per ton on rock moved or as much as $66. The low-grade mines can hardly pay, as costs are high on these small-scale operations, and high-grade mines are, unfortunately, few and far between.

Stockpiling Necessary

When the war ends the government will be in possession of mica stocks many times greater than the average amount above ground at any previous time. The bulk of these stocks will consist of lower-quality mica—that is, the qualities which will then be in strongest demand. Stocks on hand of the better qualities should be permanently stockpiled, as only these have been in short supply. Hence they will be removed from the market.

The postwar future of mica mining the world over will depend largely on the policies followed by the British and U.S. governments regarding disposition of their surplus stocks. Unless mica mining is to stagnate, an orderly and a joint plan for the disposal of government stocks must be worked out. It is suggested that such an orderly plan should provide that stocks be released for sale at a gradual rate, say something like 1 percent of total holdings to be sold monthly. All fabricators and consumers of mica, whether large or small, should be allowed to obtain mica from government stocks on equal terms. Plans must be made so that stocks will not get into speculators' hands.

New Testing Instruments

Under the stress of short supplies, there has been substantial downgrading of quality of mica required for various uses. Much research work relating to this problem has been done by large consumers. A large capacitor manufacturer has stated that during the past two years his company has exploded most of its old theories about mica qualities, and has learned more about mica in the past two years than in the preceding twenty. In addition, considerable research on mica has been conducted by the National Research Council on W.P.B. recommendation.

A factor which may have some bearing on the postwar mica situation is the development of test instruments for determining the conductivity and power factor of block mica. Recent projects, initiated by W.P.B. through the National Research Council and conducted by Bell Telephone Laboratories with the participation of a group of capacitor manufacturers, have shown that much mica rejected by visual grading is usable for capacitors and other high-quality dielectric or insulation uses. For the postwar period, economic considerations will determine if these instruments can be used to make a larger proportion of total production available for high-quality uses.

In the tests, mica of qualities rejected for capacitor use by visual inspection was tested for power factor and conductivity by the instruments. The mica selected by the instruments was then split, and each sound film was used in the manufacture of capacitors, regardless of stains or air inclusions. The results of the tests showed that the mica compared favorably with an Indian Good Stained sample carried along as control. In fact, the variation between the different lots was less than the variation observed between the products of various manufacturers.

The War Production Board has taken advantage of the tests with the Bell instruments in furthering the use of lower qualities of mica in the manufacture of capacitors, but the instruments are not yet practical for general use. Much additional work will be necessary.

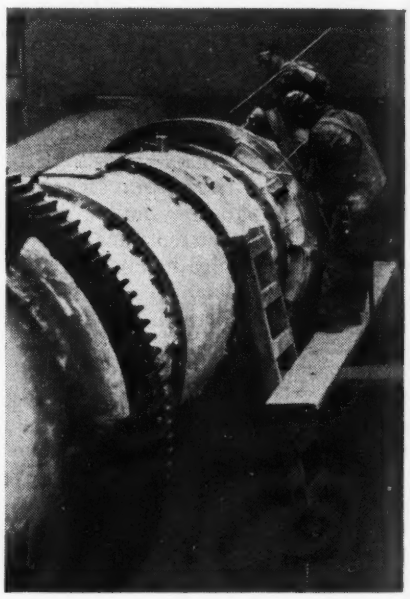
OPERATING IDEAS

Bronze-Welding an Ore Roaster

THE MAINTENANCE DEPARTMENT of a Western mining company recently saved more than half the replacement cost of a damaged cast iron ore roaster by bronze-welding, as reported in Oxy-Acetylene Tips, April 1944. Of even greater importance was the saving of shutdown time, which threatened to run to 60 to 90 days before the casting could be replaced.

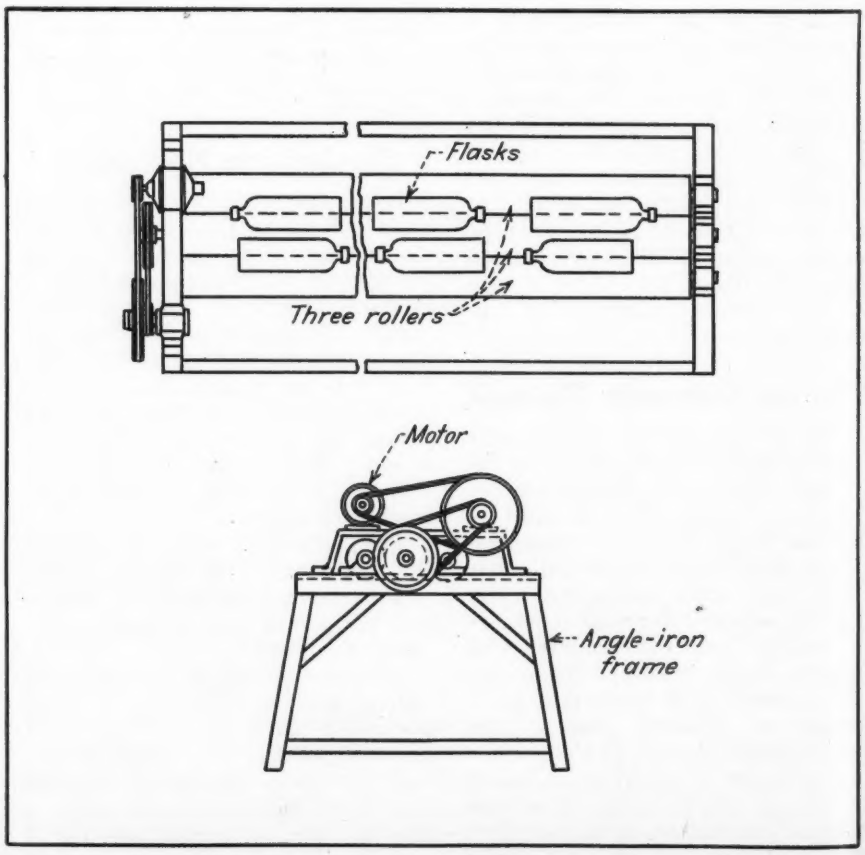
The roaster had developed cracks in its shell on both sides of the supporting ring for one of the steel tires. Inspection showed that the cracks were approximately 50 ft. long in the $1\frac{1}{8}$-in. shell. The decision to bronze-weld the casting was made because the equipment was available, and because the damaged area of the roaster would not be subjected to service temperatures above the allowable limits for bronze weld metal.

After the cracks were prepared by veeing them out with air hammers and chisels, which required a total of 72 hr., the damaged area was preheated to a temperature of 300 to 400 deg. F. by means of natural gas burners in the shell's interior. Two small burners were also used to heat the tire on the outside. During preheating the shell was revolved so as to insure an even distribution of heat. Two welding operators, working simultaneously, then welded the cracks on either side of the tire. Welding time, including intermittent time-out for maintaining preheat, was 20 hr. The casting was allowed to cool slowly and was returned to service after the insulation covering had been replaced. A total of 150 lb. of bronze rod was used. Oxygen and acetylene consumption amounted to 1,500 cu. ft. each.



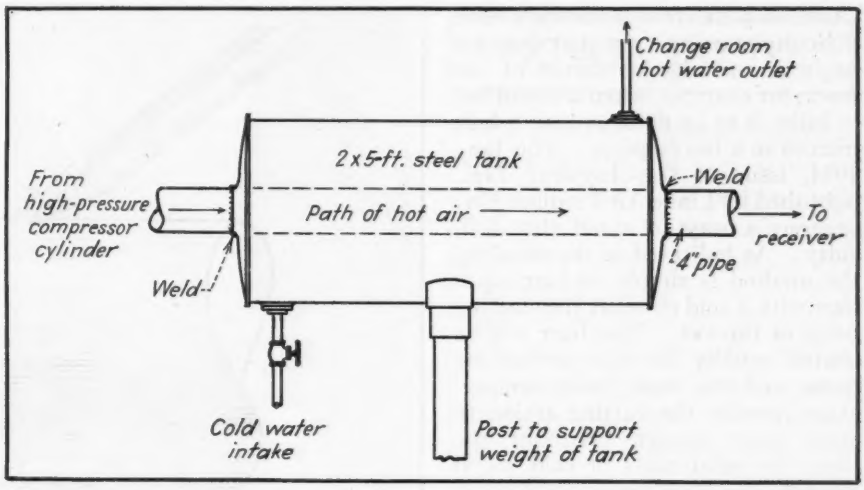
Machine for Cleaning Mercury Flasks

CLEANING OF MERCURY FLASKS—a job that never ends in the clean-up room of a plant handling mercury ore—has been materially speeded up and simplified by the machine explained in detail in the accompanying sketch. It has given excellent service at several California quicksilver properties, including the New Almaden near San Jose, Santa Clara County. Operation is continuous and entirely automatic. As will be seen, the machine is of simple design, scrap materials being used in its construction. It consists of a sturdy, all-welded, steel frame made from angle irons, with flat-iron reinforcing, and three light rollers with appropriate end bearings and rubber or canvas covering to prevent slippage of the flasks to be cleaned. The rollers are actuated through a simple belt drive by a small electric motor. Operation is simple. The flasks charged with steel shot are placed on the rollers, and the drive is set in motion. After the predetermined rolling time has been completed they are lifted off the rollers, the steel shot is removed, and the interior blown out by compressed air. As built, more than twelve flasks can be placed on rollers.



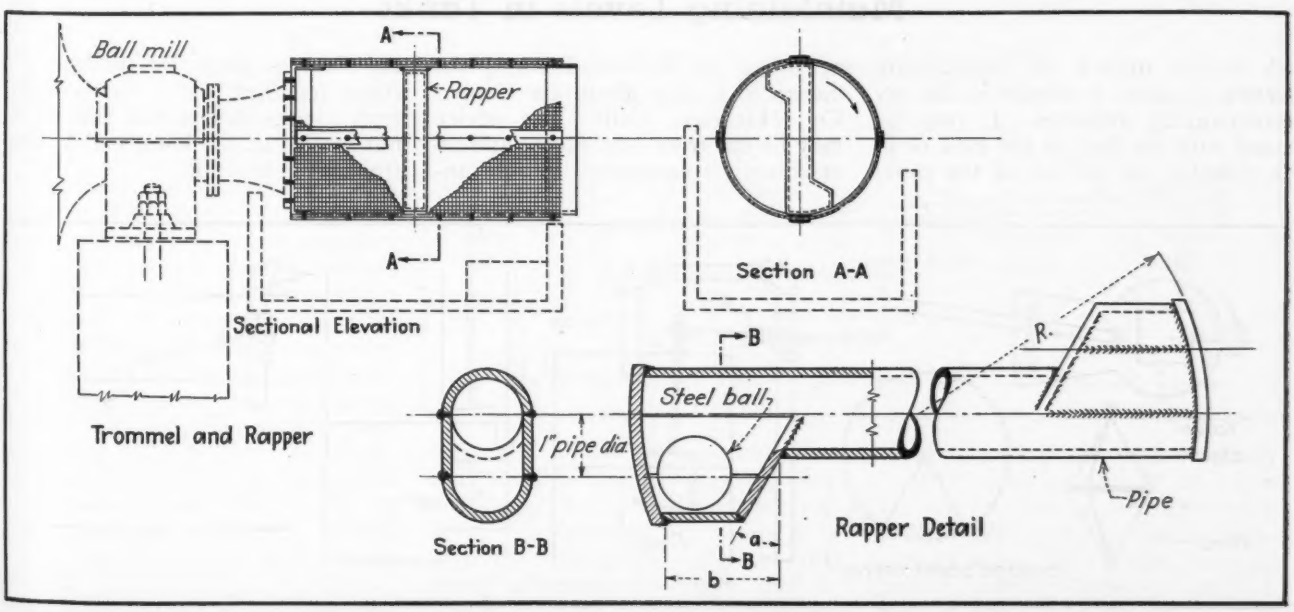
Heating Water for Change Room

In wartime, when it is difficult to obtain appropriate equipment and materials, many repair and installation problems handed over to the mechanical department of a mining enterprise for consideration cannot always be solved by conventional methods. Required equipment must either be made at the shops from materials available, or cut out entirely by designing new, and sometimes unorthodox, arrangements. At the property of Bristol Silver Mines Company, Bristol Silver, Nevada, Dominick Belingheri, Sr., confronted with the task of installing a water heating system for the change room solved the problem successfully in the simple and ingenious manner explained in the accompanying sketch. Use of a separate water heating unit was obviated by utilizing the heat radiating from the discharge pipe of the high-pressure air compressor cylinder. The major piece of equipment consists of a 2 x 5-ft. steel tank, in which a 4-in. hole was cut at each end and subsequently slipped over the 4-in. discharge pipe and secured by welding as shown. Obviously, larger or smaller tanks may be used, depending on the amount of water needed, and where the tank is suspended overhead it is advisable to support it with a post. The change room water is used only when men come off shift, and there is time for it to heat again.



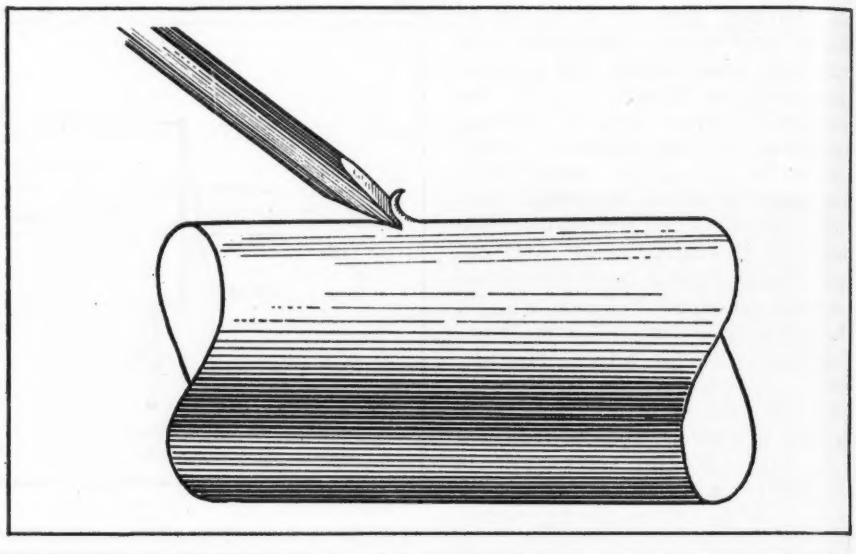
Rapper Prevents Blinding of Trommels

The accompanying sketch, submitted by Mark Lintz, mining engineer of San Francisco, Calif., illustrates a device that has been found useful in preventing the blinding of trommel screens, particularly in removing wood slivers from ball mill discharge. The sketch shows the rapper installed; two may be set at right angles for unusually bad conditions. The rapper can easily be welded out of scrap plate and pipe. A good size for a 30-in. trommel is $2\frac{1}{2}$-in. pipe and a loose-fitting ball about $2\frac{1}{4}$ in. in diameter. Angle α should be about 30 deg. for a trommel running at 25 rpm. For slower trommels the angle should be steeper. As the trommel revolves, the ball is carried from the bottom of the pocket to the top, where it drops to the opposite end of the pipe, striking twice per revolution. The rapping is very sharp, and the trommel must be well constructed to stand continuous service. For light trommels the unit may be made of 2-in. pipe and $1\frac{3}{4}$-in. ball. Where the diameter is large the dimension "b" can be increased to regulate the height of drop. In wet trommels the welding should be made water-tight. Before closing, add a couple of ounces of graphite to furnish lubrication. One of these units installed two years ago has run almost continuously to date.



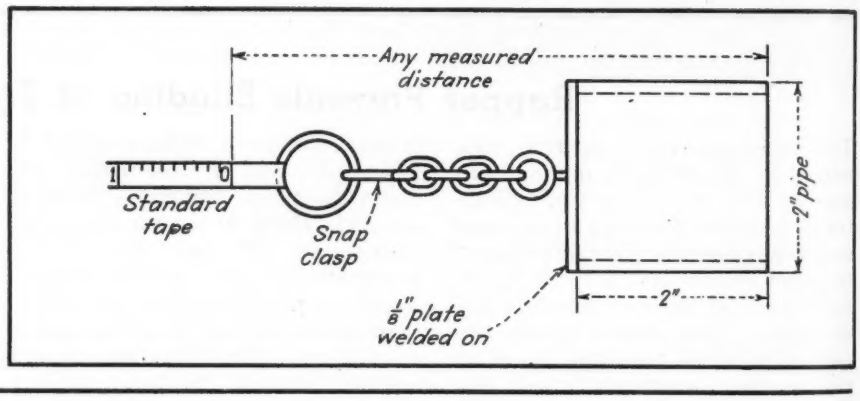
How to Start a Flame Cut Quickly

CUTTING OPERATORS sometimes have difficulty starting a cut that does not begin at an edge or corner of the work; for example, when a round bar or billet is to be flame-cut, or a hole pierced in a heavy plate. The Jan., 1944, issue of *Oxy-Acetylene Tips*, published by Linde Air Products Co., suggests a way to avoid this difficulty. As indicated in the drawing, the method is simply to turn up a burr with a cold chisel at the starting point of the cut. This burr will be heated rapidly by the pre-heating flame, and this rapid rise in temperature permits the cutting action to start much sooner. Without the burr, the solid mass of cold metal reaches a kindling temperature much more slowly.



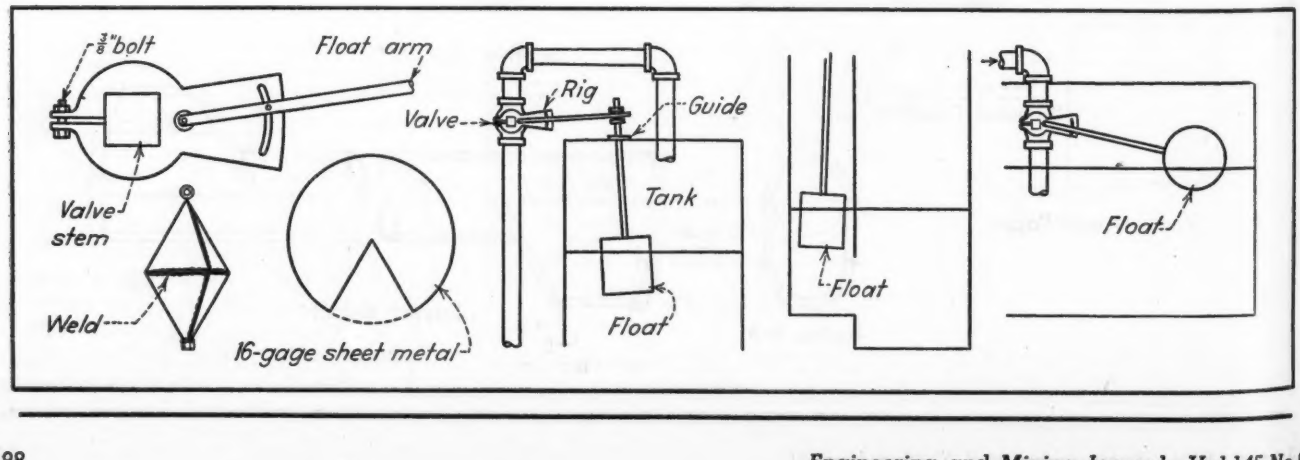
Measuring Elevation of Water in Shafts

MEASUREMENT OF THE ELEVATION of water in old shafts, deep wells, test holes, and the like, is simplified by attaching an ordinary tape to the "bell" shown in the accompanying sketch submitted by Peter P. Ribotto, Morris mine, Ishpeming, Mich. When the tape is lowered to the water level the "bell" strikes the water with a clear, sharp sound. At this point the tape is read, and the reading is corrected by adding to it the distance from the zero of the tape to the bottom of the "bell."



Maintaining Levels in Tanks

A HANDY DEVICE for maintaining levels in tanks is shown in the accompanying drawings. It may be used with the float in the tank or in a chamber on the side of the tank, according to William Tinto, plant mechanic at the Mountain Copper Co., Matheson, Calif. The device may be cut from 1-in. stock, and no machining is necessary. A substantial float is made by welding two cones together, which has been cut from 16-gage sheet metal, with a 1-in. nut welded at the lower end to keep the float in position.



Continuous Cable Testing

IN THE INSPECTION of cables, the minimum diameter is an extremely important factor in determining their safety. Routine practice usually consists in stopping the cage or skip at intervals and measuring the cables with a caliper rule. This procedure is somewhat haphazard because the cables may have developed small diameters that would be missed. In order to remove all chance from this inspection at Noranda Mines, Quebec, Canada, Mark Hanlan has designed and built a gadget that may be made in the shop at little cost. In this gadget the cable runs between rollers of proper radius which are clamped to the cable with strong springs and supported by arms mounted on double hinges set at 90 deg. to each other, so that as the cable sways the rollers will follow. The arms have electric contacts that may be set any distance apart, and which will ring a bell at any desired minimum diameter. The gadget is easily set up and has been used at Noranda for the past five years.

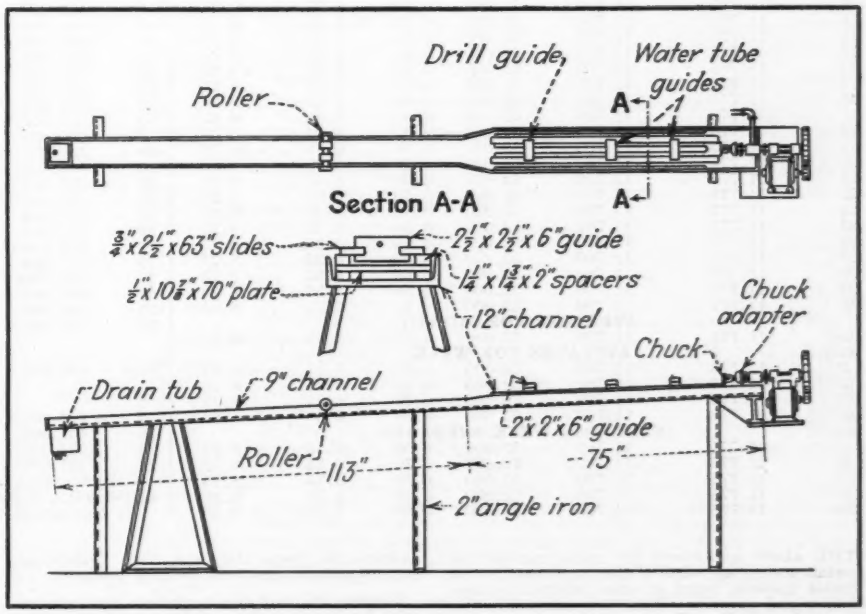
HOWJA DO IT?

You'd never win a prize in spelling or pronunciation if you wrote or talked that way, but you can win $5 if you'll show the Editors of E&MJ how you solved a knotty problem, or made an emergency repair, or otherwise proved the old adage that necessity is the mother of invention. And what's more, you'll probably help some other operator meet a similar situation. Just send a brief, but complete, statement of your idea, together with a sketch or photograph. It's really in the interest of your fellow operators that we ask, "Howja do it?" And the $5 we offer for a useful idea is just to jog your memory about something you may have forgotten.

Machine Cleans Clogged Drill Steel

AT MANY MINES a considerable amount of clogged steel, otherwise perfectly sound, is condemned every month to the scrap pile because the cost of cleaning out the drills by hand exceeds that of manufacturing new units for replacement. Only by performing the operation mechanically can steel be rendered serviceable at the lowest possible cost. The problem was solved satisfactorily at the drill sharpening shop of the United Verde Branch of Phelps Dodge Corporation, at Jerome, Ariz., with the development and construction of the simple machine shown in the accompanying illustration. The machine, built on the order of a lathe, consists of the following parts: A main frame of 12- and 9-in. channel irons; $\frac{1}{2}$-in. steel plate; spacers, slides, and guides of dimensions shown in the drawing; two steel guides for the water tube, and one for the drill; guide roller; drive support; a hollow steel shaft, equipped with a packing gland and a $\frac{3}{8}$-in. chuck to hold the cleaner or water tube; gear drive with a small direct-connected motor; and a drain tub.

Operation of the machine is simple.



After the hollow cleaner tube, one end of which is converted into a drill bit by a 45-deg. tempered bevel, the operator places his drill upon the steel guide and roller and slowly advances the clogged end to the cleaner tube. To aid the cleaner bit in removing the matter within the drill, and also prevent its burning, water is injected through a valve arrangement under pressure. Discharged water flows down the 9-in. channel frame extension into a 7x7x7-in. steel drain tub.

MARKET SUMMARY

DEMAND FOR MAJOR non-ferrous metals during July continued at a high rate, but tonnages moved to fabricating plants dropped below the peak level, owing largely to manpower shortages, both at producing centers and at brass and wire mills. Part of the drop in activity was seasonal. Price developments centered around the minor metals—quicksilver and iridium. Indium was easier. Thallium was scarce and prices were largely nominal. Metals Reserve is reducing its purchasing basis on Chilean copper ore, but the buying program for metal continues unchanged. Smelters treating Tri-State zinc concentrate have been offered a premium to maintain output, as smelting costs have risen during the last year and a half.

If anything, the over-all supply picture in copper improved during July. Domestic output at the mines decreased, but imports were maintained without difficulty and shipments to domestic consumers were smaller than in the March-April-May period. In addition to the tonnages imported from Latin America, the copper authorities arranged to bring in more metal from Canadian sources. The June statistics showed domestic deliveries totaling 140,932 tons, which contrasts with the peak load of 165,714 tons in May. Estimates made privately late in July indicate that the deliveries for both July and August will hold at about the 140,000-ton rate. Civilian consumption of copper was restricted to a minimum, as for some time past, but as July ended there was hope that the regulations may be eased shortly. The stockpile of copper now consists of about two months' supply at the current rate of consumption. The so-called pipeline (fabricators' working stocks, etc.) is full.

Tension among consumers of lead continued until the strike situation in Mexico showed signs of definite improvement. This occurred around the middle of the month. Domestic production of refined lead may drop to below 40,000 tons a month before the summer is over, and, with consumption averaging more than 60,000 tons a month, the need for supplementary supplies from foreign sources becomes apparent. In fact, consumers asked for 30,000 tons of foreign lead for August delivery. The stockpile of lead remains comfortable, but the reserve supply is largely corroding brands.

Major Metals

U.S. DAILY AND AVERAGE PRICES

1944	Electrolytic Copper		Straits Tin	Lead		Zinc
	Domestic	Export	New	New		
July	(a) Refinery	(b) Refinery	York	York	St. Louis	St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	Holiday	11.700		Holiday		
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
		AVERAGES FOR MONTH				
July	11.775	11.700	52.000	6.50	6.35	8.25
July		AVERAGES FOR WEEK				
5	11.775	11.700	52.000	6.50	6.35	8.25
12	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
26	11.775	11.700	52.000	6.50	6.35	8.25
July		CALENDAR WEEK AVERAGES				
1	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1944	Sterling Exchange		Silver (c)		Gold	
July	"Checks" (Nominal)	"90-day demand"	New York	London	London	(d) United States
1	401.000	(f)	(e)	(e)	(e)	$35.00
3	401.000	(f)	44.750	23.500	168s	35.00
4	Holiday	Holiday	Holiday	23.500	168s	Holiday
5	401.000	(f)	44.750	23.500	168s	35.00
6	401.000	(f)	44.750	23.500	168s	35.00
7	401.000	(f)	44.750	23.500	168s	35.00
8	401.000	(f)	(e)	(e)	(e)	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	401.000	(f)	44.750	23.500	168s	35.00
12	401.000	(f)	44.750	23.500	168s	35.00
13	401.000	(f)	44.750	23.500	168s	35.00
14	401.000	(f)	44.750	23.500	168s	35.00
15	401.000	(f)	(e)	(e)	(e)	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	44.750	23.500	168s	35.00
19	401.000	(f)	44.750	23.500	168s	35.00
20	401.000	(f)	44.750	23.500	168s	35.00
21	401.000	(f)	44.750	23.500	168s	35.00
22	401.000	(f)	(e)	(e)	(e)	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25	401.000	(f)	44.750	23.500	168s	35.00
26	401.000	(f)	44.750	23.500	168s	35.00
27	401.000	(f)	44.750	23.500	168s	35.00
28	401.000	(f)	44.750	23.500	168s	35.00
29	401.000	(f)	(e)	(e)	(e)	35.00
31	401.000	(f)	44.750	23.500	168s	35.00
		AVERAGES FOR MONTH				
July	401.000	.....	44.750	23.500	....	35.00
July		AVERAGES FOR WEEK				
5	401.000	.....	44.750			
12	401.000	.....	44.750			
19	401.000	.....	44.750			
26	401.000	.....	44.750			

Calendar week averages, New York Silver: July 1st, 44.750; 8th, 44.750; 15th, 44.750; 22nd, 44.750; 29th, 44.750

(e) Not quoted (Saturday). (f) No quotation.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout July.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Producers believe that the supply-demand situation in zinc has eased sufficiently to permit increased consumption of the metal in civilian products. Some easing of the regulations has been announced by WPB, but in nearly all instances modification rests heavily on the supply of sheet steel for galvanizing and manpower. Stocks of slab zinc in the hands of the industry at the end of June totaled 225,449 tons, against 173,666 tons at the end of 1943. Shipments during June to consumers and for export totaled 65,603 tons, according to the American Zinc Institute.

The decline in prices for quicksilver that has occurred since the beginning of the year has finally caused most of the mines to suspend operations. The New York quotation dropped to $97 per flask during July, but recovered to $102 as the month ended, on the feeling that production is well below the current rate of consumption. There was some fairly good buying on the dip below $100.

Iridium is in better supply and available at $120 per ounce troy. Other platinum metals remain unchanged.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for June and July.

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations, (e) Special shapes sold to platers.

	June	July
Quicksilver, N. Y. flask	101.692	100.560
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	*16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922–1923–1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80
	1943	88.74	

	1942	1943	1944
January	85.39	88.74	88.74
February	85.90	88.74	88.74
March	85.90	88.74	88.74
April	85.90	88.74	88.74
May	85.90	88.74	88.74
June	85.90	88.74	88.74
July	85.90	88.74	88.74
August	85.90	88.74	....
September	88.74	88.74	....
October	88.74	88.74	....
November	88.74	88.74	....
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated
(Aug. 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots, 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Indium, troy oz	$7.50@$8.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$102.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$12.50 nom.
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$14.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.01
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 per cent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 60 per cent, duty paid	$24.00
Domestic, 60 per cent and upward	(a) $25.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28
(a) Prices at mines, small lots, usually several dollars less.	

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10c.
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@$9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f. o. b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, F.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica—The Colonial Mica Co., agent for Metals Reserve Co., on recommendation of WPB, extended its arrangement to purchase domestic strategic sheet mica at $6 a pound up to Dec. 31, 1944. This applies to No. 1 and No. 2 qualities, sizes 1 x 1 in. and larger full trim, and sizes 1½ x 2 in. and larger three-quarter trim.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base price, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Federal Agencies Frown on Taxing Premium Income

State tax policies in regard to premium payments for over-quota production of copper, lead, and zinc have been the subject of much unofficial discussion in Washington. Concern is evident over the possibility that local tax policies may defeat the purpose of the subsidy. The purpose of the premium quota plan to provide a means for the quick expansion of output and "to compensate operators for extra costs involved in bringing out additional metal output." This refers particularly to high-cost marginal ores. Washington officials generally are of the opinion that the way premiums and quotas are figured indicates the manner in which mines should be taxed. Facts and figures are submitted to the quota committee, which uses the information to establish quotas and subsidies for over-quota production. The bonus includes as an item of excess cost the amortization of special installations that might be necessary to get out the marginal ore. It also includes a normal operating margin from which taxes, depreciation, depletion, and other overhead items must be paid. Profit, if any, comes out of the operating margin, too. The operating margin is not as high for the marginal ores as it would be figured for the normal-cost ores.

Federal law does not prohibit states from taxing bonus payments. However, Washington is outraged that some states would consider anything but the net profit derived from the premium payments. Some states base ad valorem valuations on gross income and if bonuses are classed as part of gross income taxes are thereby increased. These bonuses are paid to get out metal needed in the war effort and not to take care of State taxes.

Subsidy for Smelting Tri-State Concentrates

Smelters treating Tri-State zinc concentrates have been offered financial assistance to continue maximum production of zinc from the concentrates originating in the Tri-State area. This action followed a recommendation made by WPB to Metals Reserve Co.

Contracts providing subsidy payments to such zinc smelters are now in effect, WPB explained. The base price of Tri-State concentrates f.o.b. mines or mills has been established at $55.28 per ton. Later, smelters found the margin between this figure and the 8¼ c. per pound price of Prime Western Metal inadequate to make handling the Tri-State concentrates profitable.

Smelters have shown a reluctance to treat maximum quantities of Tri-State concentrates for the last six months. This has resulted in government stockpiling of the material, and tonnages have been increasing steadily. The War Production Board believes this condition should not be allowed to continue.

Actual smelting costs have risen substantially during the past year and a half, it has been pointed out by the industry. Unavoidable upward revisions in the prices of coal, coke, gas, and supplies have contributed to the changing situation. Labor shortages are stressed as another important factor in production cost increases.

Industry Not Surprised By Stockpile Figures

The stockpile figures, published by the *Wall St. Journal*, which unquestionably were obtained from some official source, are not wholly up to date, and are guessed to be a few months old. Their release caused a furor in the WPB mineral divisions, which were thoroughly annoyed over publication of the information, which, however, cleared the Office of Censorship. After some consideration, WPB has decided against releasing a correct list.

By and large, there is little in the figures that has not been discounted in industry thinking. Much of the bauxite, chrome ore, and manganese ore is low grade, and disposal will be more of a problem to the government than to the industries affected. The copper figure is not imposing, but this is only a fraction of the metal which the industry will face when military surpluses, runaround scrap, and salvaged metals are available. The most impressive figure is the zinc total, but inasmuch as the amount is less than current industry estimates, publication did not arouse particular concern in domestic zinc industry circles.

Nelson Insists That Limitations Be Relaxed

Donald Nelson's plans for the relaxation of controls on civilian production go into effect this month in spite of supposedly strong opposition within his own organization. Four orders were written to put the general plans into effect, the last of which was issued this month. The orders are:

1. To relax some of the limitations on the use of aluminum and magnesium. This has been done by increasing the list of eligible items which can be manufactured from the light metals. Substitution for other metals beyond 500 lb. per quarter will be handled by a deferred allotment under CMP.

2. To permit the manufacture of experimental models of postwar items. Expenditures are limited to $5,000 per month without specific approval. All sales and promotion activities are banned.

3. To permit placing unrated orders for machine tools for postwar use in producing civilian items.

4. The fourth order, and the last one to be put into effect, puts the basis of responsibility for resuming civilian production in the hands of WPB regional directors. Manufacturers who are able to establish to the satisfaction of the regional director that facilities, manpower, and material are available and that no harm will be done to the war effort, may produce civilian items or increase the quantities of articles whose production previously had been limited.

The first three orders were issued during the last two weeks of July and the last order was promulgated on Aug. 15. The official announcement stated, "The schedule was set in order to give the War Manpower Commission more time to perfect its organization and administrative controls." Originally the orders were scheduled to be issued on July 1. The introduction of WMC's priority referral plan for labor also scheduled to go into effect July 1 was given as the reason for the delay.

Actually more heat was generated in official Washington than the importance of the orders would seem to warrant. The first three merely formalized accomplished facts. For some months aluminum has been available to manufacturers on special application. Manufacturers generally have "cribbed" enough material for their experimental models. Plans for special machine tools have long since been finished and their production has been discussed with the machine tool makers. Certainly, standard machine tools are not being ordered in the face of known government-owned surpluses that will be available after the war. The only order of consequence was the last, which implemented the first three.

The basic controversy which delayed development of Donald Nelson's program was over war-worker psychology. Those opposed to early plans for reconversion argued that any such movement tended to encourage workers to leave their jobs before the end of the war period. Such a movement was greatly feared, especially by the Army and Navy. Hence, they and many of the operating executives of WPB opposed, and still do oppose, any government gesture which sanctions resumption of peacetime activities.

Donald Nelson advanced and finally put into force his proposed plans for reconversion by a different argument. It

was his belief that workers would stay on the war jobs better if they knew that peacetime employment was being planned systematically so that peace jobs would be available when war jobs terminated. He felt that the evidence of such planning would help keep war workers on their job rather than encourage them to shift.

Another view of the reconversion argument is that these orders will mean little or nothing until the supply of steel again becomes easier. Great Britain is now re-exporting steel to this country at the rate of 10,000 tons per month. The list of consumer items which has been drawn up to receive "preferential treatment" under the Nelson relaxation orders contains few which do not require steel in some form as the major basic raw material. Also, a lack of components, such as small electric motors or ball bearings, will prevent completion of many items of civilian goods, even if all the needed raw materials become available. Shortage of rolled steel and of manpower forced the WPB Requirements Committee to refuse an ODT request that production of light trucks be resumed in the first quarter of 1945.

Policies Created for Surplus Plant Sales

Working in the "goldfish bowl," as prescribed in the Baruch-Hancock report, officials of Defense Plant Corporation have outlined the policy which will be followed in the sale of government-owned industrial property.

The value of the property to be sold is first established. For this purpose the present-day replacement cost is used, figured as if the plant was to be built without overtime or any other expenses directly traceable to the speed of wartime construction. Parts that have no value to the prospective purchaser are not considered an item in the value of the plant unless a substantial sum is involved. In that case, the Defense Plant Corporation will endeavor to find a purchaser for whom the special features will have use and value. The reductions made are not theoretical figures but must be substantiated by facts. Depreciation is then taken under consideration before DPC arrives at a base figure which is the selling price at which they aim. Sale is made to the highest bidder.

The first sale of what might be considered a major industrial facility, to the General Aniline & Film Corp., is not a complete test of how the policy works out. There was only one actual bidder. Some interest was displayed in the property by Tungsol Lamp Co. and Firestone Tire & Rubber Co., but these firms made no firm offers. In this transaction the replacement cost—the land and buildings less one year's depreciation less cost of the special appurtenances the purchaser did not need, which included a target range, special lights and air conditioning equipment—came to approximately $180,000. The final sales figure was $175,000.

Committee Takes Middle Position on Stockpiles

Opposition to stockpiling of mineral and metal surpluses except as recommended by the military forces has been voiced by the surplus property subcommittee of the Senate Committee on Small Business in a report made public the last of July. The subcommittee consists of Tennessee's Stewart, Ohio's Taft, and Montana's Murray.

Offhand, the committee's attitude seems unfriendly to the interests of the mining industry. However, careful study of the report's language shows that although the committee opposes complete freezing of government stocks, it is not in favor of disrupting the mineral markets by government dumping. If this viewpoint prevails, everything will depend on the wisdom exercised by the Surplus Property Administrator and his delegates.

The full text of the report on dumping and strategic minerals is as follows:

Dumping

"A related phase of the full-production and full-employment objective is the prevention of dumping. While commentators are unanimous in stressing the danger of a disorderly release of surplus into the private markets with resultant abnormal depression of prices, some have regarded it as equally important to emphasize the dangers of the opposite extreme. They hold that a policy of holding merchantable stocks off the market for long periods of time will have a depressing effect on production, will deprive consumers of needed goods, and will slow down the whole process of reconversion. As a representative of the Procurement Division of the Treasury Department has said, 'Who would invest money in a shoe factory if he knew the Government held warehoused 10,000,000 pairs of shoes awaiting future release on a signal from Washington?' The advocates of immediate but controlled release of surpluses point to the experience of the last war when surplus goods were held off the market during the inflation boom of 1919 and early in 1920. It was not until the market began to decline in the summer and fall of 1920 that surpluses were dumped in volume and almost regardless of value. This, it is claimed (probably with undue emphasis), contributed to the 1921 depression.

"If surpluses are not to be released haphazardly, all markets are not to be protected indiscriminately. The markets for many products are artificially restricted—supply is controlled and prices are not competitive. Certainly a market that is not free has no claim upon the protection of the Surplus Property Administrator. Where the Government's inventory of a particular product exceeds the capacity of a free market to absorb without undue dislocation, the Administrator should, with the advice of an industry advisory committee, provide for periodic sales so as to permit the industry to gage the market and make the necessary accommodations. But as the Attorney General has emphasized, no one intends that the Administrator of Surplus Property should be given power, through the sale of surpluses, to prevent competition or to regulate the market. Courage will be required in such cases if the Administrator is not to freeze surpluses for extensive periods in response to pressure-group demands, and wise judgment if he is to accommodate the release of surpluses to market conditions without artificial regulation of the free play of economic forces.

Strategic Metals and Minerals

"In no field is the danger of dumping more real or pervasive than in metals and minerals, including both the primary and secondary forms. In metals and minerals competition between Government-owned surpluses and new commercial production is direct and unmitigated. In the case of fabricated goods, new commercial production will be able to offset the competition of Government surpluses with innovations in design, color, and more economical performance. In the case of metals and minerals (as in the case of other raw materials) new commercial production will be able to offer no sales premiums.

"The problem is aggravated by the existence of huge stores of scrap metal which, like the stock piles of primary metals, must be considered in estimating the Government surplus which is in potential competition with new commercial production. The scrap metals are economically recoverable in varying degrees, ranging from the 100 percent recoverability of copper scrap to the relative unrecoverability of zinc scrap. Estimates now available point to the existence of very substantial surpluses in certain of the metals—running as high as several normal years supply in the case of copper.

"Spurred by consideration of these huge metal surpluses and mindful of Pearl Harbor, which saw this country dangerously short of its war requirements for certain strategic metals, the mining industry has come forward with proposals for legislation designed to create vast stockpiles of metals and minerals against the requirements of a future war. The most conservative of these proposals would have the effect of withholding from the commercial market all the Government-owned surpluses; others call for the increase of the stockpiles. A number of objections have been made to this approach. It is argued that some of the stockpiles would be greater than military considerations would require and that the static stockpile theory smacks of the discredited Maginot line strategy of preparing to fight the wars of the future with weapons of the past; it is suggested, instead, that the wise disposition of

(*Continued on page* 150)

NEWS OF THE INDUSTRY

Coast Mining Committee Seeks Higher Gold Price

Benefits of the world demand for gold at prices in excess of $35 an ounce should be available to American miners, according to a resolution adopted on July 6 by the Board of Directors of the San Francisco Chamber of Commerce on recommendation of its mining committee.

After noting that a limited market for gold bullion exists in India and North Africa, as examples, at prices in excess of the legal price in the United States and that the American government is supporting armed forces for the defense of countries where there is a great demand for gold, the resolution proposes procedure by the President of the United States and the State Department whereby both the American government and domestic producers could obtain the benefits.

Support of the Chamber's position is being sought from all of the Congressmen of the Western states as well as various organizations concerned with the domestic mining industry.

MMSW Convention to Weigh Postwar Problems

The 41st convention of the International Union of Mine, Mill and Smelter Workers will be held in Pittsburgh, Pa., Sept. 11, and will continue until the business of the meeting has been completed.

In announcing the convention, James J. Leary, secretary-treasurer, declared that it is most important that all local unions be represented to take action to continue support of the war effort and to "defeat the enemies of labor in their determination to crush the trade union movement."

Reid Robinson, president of MMSW, said that delegates to the convention must be prepared to act on the problem of "your job this year and next; full employment for the duration of the war and after the war." Quick reconversion is needed, he holds, and favors a government stockpiling policy for the mining industry to provide postwar jobs and avoid waste of the nation's natural resources.

Workers Given Awards in War Production Drive

O. F. Wallen, employed by Anaconda Copper Mining Co., at Anaconda, Mont., has been awarded an honorable mention for production ideas by the War Production Drive's Board for Individual Awards. After Pearl Harbor, Japanese bamboo rapping poles became scarce. They were used to rap the collected dust from suspended rows of wires in the Cottrell treaters into the receiving hoppers below. The poles must be at least 18 ft. long. Native lodge-pole pines were suggested by Mr. Wallen as a substitute for bamboo, and these met the requirements in diameter, length, and whip.

Fusing instead of soldering copper wires was suggested by Walter Lindall, of Submarine Signal Co., Boston. Instead of scraping, tinning, twisting, and soldering, he twists the leads together and applies an oxygen flame torch, instantly fusing the ends and making a solid joint. Mr. Lindall also has been given honorable mention.

Senate Committee Gathers Data on Metals Program

The Subcommittee on Mining and Minerals of the Senate Committee on Small Business, of which Senator James G. Scrugham (Nev.) is chairman, has started gathering data for a report on this country's critical and strategic minerals program, it was announced in Washington on July 24. Hearings, Senator Scrugham said, probably will be held in the fall.

"Congress should know just how the nation's procurement program has been handled, what it has cost, and what bearing any investments and commitments which have been made will have upon postwar domestic mining," the Senator declared.

The subcommittee is planning immediate studies of postwar possibilities of domestic mining, such studies to be integrated with the foreign mineral procurement investigation.

"I have an idea," said Senator Scrugham, "we will find, with the exception of a few inevitable sour spots, that foreign procurement has been well handled even though the costs in some instances may have been rather high. During the war the principal aim is to get needed supplies, and I have no quarrel with the results to date. I do believe, however, that we must plan our postwar trade, stockpiling program, and tariff arrangements so as to give domestic operators the best possible break."

Copper Industry in the United States, 1941-43

	Bureau of Mines		
Production of Copper:	**1941**	**1942**	**1943**
Smelter output, tons	966,072	1,087,991	1,092,939
Mine production, tons	958,149	1,080,061	1,090,818
Refinery output (new copper), tons:			
Electrolytic (a)	929,711	963,177	938,727
Lake (a)	45,697	46,523	44,867
Casting	.....	55,092	98,485
Total domestic	975,408	1,064,792	1,082,079
Total domestic and foreign	1,395,309	1,414,561	1,379,263
Copper ores, old tailings, etc., tons	78,452,504	92,285,626	(b)
Average yield of copper, percent	1.15	1.09	(b)
Copper ores, etc., concentrated, tons	72,531,712	85,865,167	(b)
Average yield of copper, percent	1.06	1.02	(b)
Copper ores smelted, tons	2,135,138	2,221,191	(b)
Average yield of copper, percent	4.29	4.00	(b)
Average price per pound, cents	11.8	(c) 11.8	(c) 11.8
Imports, unmanufactured, tons	735,545	(d)	(d)
Exports, tons (e)	158,893	(d)	(d)
Withdrawn on domestic account, tons	1,641,550	(f) 1,678,091	1,621,666
Stocks, refined (g), tons	77,500	84,000	68,500
Stocks, blister and in process (g), tons	240,000	235,500	241,000
Value of smelter production from domestic ores	$227,993,000	(c) $256,766,000	(c) $257,934,000

(a) Some Michigan copper is electrolytically refined and is included under electrolytic copper. (b) Not yet available. (c) Exclusive of bonus payments of the Metals Reserve Co. (d) Data confidential for 1942 and 1943. (e) Total exports of copper, exclusive of ore, concentrates, composition metal, and unrefined material. (f) Revised. (g) At end of year.

Slab Zinc Stocks Mount in First Half of 1944

Production, shipments, and stocks of slab zinc during 1943 and the first six months of 1944, in tons, according to the American Zinc Institute:

	Production	Total Shipments	Stock
1943–			
January..	83,870	77,221	96,107
February.	76,667	74,762	98,012
March....	83,787	76,033	105,766
April.....	81,057	78,781	108,042
May.....	82,399	79,426	111,015
June.....	78,865	74,191	115,689
July.....	80,249	70,778	125,160
August...	79,736	71,810	133,086
September	79,361	69,160	143,287
October...	83,066	71,946	154,407
November	79,834	75,508	158,733
December.	83,165	68,232	173,666
	972,056	887,848	
1944–			
January...	84,066	63,637	194,095
February.	79,894	62,696	211,293
March....	86,037	84,443	212,887
April.....	80,405	75,284	218,008
May.....	80,497	(a)80,524	(a)217,981
June.....	73,071	65,603	225,449

(a) Corrected.

Quebec Bush Fires Sweep Some Mining Districts

The mining district of Northwestern Quebec, during the first half of July, suffered the most serious losses on record from bush fires. Near the Perron gold mine, Pascalis village was wiped out save for one house after the 400 residents had been moved to Val d'Or. The O'Brien mine and Kewagama town were threatened but not more than six buildings were destroyed. Several hundred people were moved by train to Rouyn and Noranda from Cadillac before a change in wind removed the fire hazard. Numerous fires over 10,000 sq. mi., extending eastward from the Ontario boundary to Louvincourt township, threatened many camps where diamond drilling and surface exploration are in progress. Property damage, timber excepted, is put at $500,000.

Mine Supplies Listed As Surplus Property

As of July 15, various agencies of government have declared property having a total value (cost) of $181,422,667 to be surplus, and thus available for disposal. Of this total, $52,562,554 has been sold.

The total includes $13,500 worth of alloy metals, stored at Atlanta, and $768,987 worth of nonferrous metals, of which $13,340 has been sold. These metals are stored mainly at Atlanta, Boston, Cleveland, New York, Philadelphia, and Richmond.

As of June 30, Metals Reserve had declared surplus $1,418,524 worth of mining spare parts and supplies, of which $699,176 had been sold.

Gold Retained in Monetary Stabilization Plan—Silver to Receive Future Study

The United States Monetary and Financial Conference agreed July 21 on a plan for postwar stabilization of currencies in foreign exchange operations and the establishment of a banking institution for reconstruction and development. Except in matters relating to quotas and capital requirements, the final agreement follows closely the proposed plan submitted to the delegates at Bretton Woods, N. H., when the meeting was called on July 1. Before the agreement can become effective, the 44 nations represented at the gathering will have to approve the plan.

Agreements reached embrace broad cooperative action to maintain international monetary stability and a credit system designed to promote foreign trade and reconstruction in the postwar period, and will be presented to the legislative bodies of the participating nations for ratification by the time the war ends.

Practices held to be harmful to world prosperity will have to be outlawed after the war, the delegates agreed, and the agreement paves the way for action pointing toward international cooperation in promoting postwar trade. Need for overcoming short-term foreign exchange difficulties was stressed. To further this objective, it was agreed to establish the International Exchange Fund, capital $8,800,000,000.

Gold is destined to play an important part in the stabilization fund in that a member country must contribute to the fund either 25 percent of its quota in gold or 10 percent of its gold holdings, whichever is the smaller.

Countries interested in silver made a strong plea for the inclusion of the metal in the monetary plan, but the proposal was not acted upon at the meeting. The Mexican delegation pressed for consideration of silver, urging that it be used for monetary purposes at a ratio of one ounce of gold to ten ounces of silver. The conference finally passed a resolution to the effect that the subject of silver should receive further study by the interested nations.

Toward the close of the proceedings, chief effort centered in completing a plan for a bank for financing reconstruction and development, as well as guaranteeing postwar loans and investments. It was agreed to organize the International Bank of Reconstruction and Development, capital $9,100,000,000, to finance the program. The bank eventually will have a capital of $10,000,000,000 when countries now outside of the agreement are admitted to membership.

In a report on the conference, issued soon after the meeting ended, it was declared that expanded international investment is essential to promote trade in the postwar period, and the bank has been organized to provide a portion of the capital needed for reconstruction and development. It was agreed that the bank should assist in providing capital through normal business channels at reasonable rates of interest and over long periods for projects which will raise the productivity of the borrowing countries.

The conference recommended that in carrying out the policies of the institutions proposed, special consideration should be given to the needs of countries which have suffered from enemy occupation and hostilities.

The Latin-American group, after hesitating agreed to come into the bank plan and subscribe 70 percent of its fund quotas after getting a concession that equitable consideration would be given by the directors of the bank to loans for exploitation of the natural resources of undeveloped countries.

Headquarters for both the fund and the bank will be located in the United States, as this country's contribution to both organizations will be the largest.

The agreement reached, in the opinion of the Coordinating Committee, of which Fred M. Vinson, vice chairman of the United States delegation and chairman of the Office of Economic Stabilization, was chairman, is without precedent. The many difficulties that will have to be surmounted to promote postwar trade were recognized by all attending the meeting, and it was agreed that nothing short of international cooperation along the lines indicated in the agreement would suffice to avoid postwar chaos.

Lower Federal Taxes Urged for Canadian Mining

Efforts are being made in the House of Commons at Ottawa to reduce Federal taxes on mining. A. R. Adamson pointed out that less than 1 percent of Canadian mining companies incorporated between 1907 and 1941 had "attained economic success," while only one-third had returned invested capital, and taxes were levied on the capital of the remaining two-thirds. The average profitable productive life of gold and silver mines in Ontario and Quebec was less than 8 years, a capital investment of $2,000,000 to $5,000,000 being required for bringing a mine into profitable production. A period of almost 70 years is required under present tax laws for repayment of capital free of tax, under allowances of 33⅓ percent for depletion and 20 percent on dividends paid to Canadians.

Proposal is made to apply a 50-percent depletion allowance on the net earnings and dividends of all metal mines, which would mean that 25, rather than 70, years would be required for repayment of capital free of tax. It is also proposed to deduct taxes paid to the municipality and to the Province, and to allow deductions representing all expenditures on outside exploration.

Bureau to Maintain N.C. Laboratory Staff

Following a conference held at Raleigh, N. C., July 25, it was announced that the United States Bureau of Mines will maintain a large staff of engineers, research workers and laboratory workers at North Carolina State College in Raleigh for an expanded minerals program embracing the entire Southeast.

Under the program, which is effective immediately, the Bureau will take over existing laboratory and machine shop facilities at the college and will explore mineral deposits in North Carolina and the Southeast with a view of setting up pilot plants and using the deposits. Instruction in metallurgical subjects also will be inaugurated at the college.

The work, it was announced, will be under the direction of Dr. A. L. Fox, metallurgist with the U. S. Bureau of Mines' laboratory at Salt Lake City, Utah.

Dr. R. S. Dean, assistant director of the Bureau, who attended the conference, said that "the immediate purpose of the program is an investigation toward production and use of iron and alloys for local supplies, rather than for use in central production." The program, he said, is part of the Federal program of locating and utilizing strategic minerals.

"It is not enough to know that deposits of strategic minerals are located at various points throughout the country," he declared. "We must work out specific laboratory means of best utilizing each deposit in other than standard procedures."

Tin Producers Hope for Renewal of Control Plan

Tin producers maintain that they performed an important economic service through international tin control, and hope to continue with the plan, perhaps in some modified form, in the postwar period. In reviewing tin control, the International Tin Committee holds that its inter-governmental scheme should merit the attention of economic experts of the United Nations, because the advantages of stabilizing prices of primary commodities are now generally acknowledged, and the issue may have to be decided very soon.

In a conclusion to a brief on tin control, the Committee recalls that there are two parts to the system of regulation whereby supply and demand are maintained in equilibrium. The basic machinery is provided by the control of exports from the signatory countries. "This is fully capable of achieving equilibrium in the long run," the Committee holds, "but there are obvious limitations to its effectiveness over short periods. Quota changes take time to make themselves felt in world markets; by the time their influence is apparent the need may have disappeared. Accordingly it was necessary to devise the more rapid and flexible instrument of the buffer and stabilizing stock."

"Tin control," the Committee avers, "served the interests of both producers and consumers. The maintenance of world prosperity demands that the work of primary producers shall be kept remunerative. The tin industry is ready to do its part."

CIO Certified As Agent for Five Quebec Mines

The CIO International Union of Mine, Mill and Smelter Workers has been certified as collective bargaining agent for five mines in Northwestern Quebec, namely, Waite Amulet, Golden Manitou, Beattie, Senator-Rouyn, and Powell Rouyn. Previously, Noranda employees had voted endorsement and negotiations are in progress. The case of Lamaque Mines, first applicant to appoint a bargaining agent, was dismissed and further action is pending.

McGraw-Hill Executive Will Handle Mineral Sales

Mason Britton, who recently retired as vice president of the McGraw-Hill Publishing Co. after 43 years of service in the organization, has been appointed assistant administrator, Surplus War Property Administration. He will supervise the sale of all kinds of surplus property for which the RFC is the disposal agency. This includes industrial plants and equipment, metals, and minerals. During the first World War Britton was a civilian technical officer; and during the postwar adjustment period, 1920–24, he was chairman of the Army Surplus Property Commission. During the present war, he has served as Director of Tool Production for OPM, as chairman of the Task Committee of the Printing and Publishing Advisory Committee of the War Advertising Council, and as a member of the Business Advisory Committee of the Department of Commerce.

GOVERNMENT STOCKPILES OF MINERALS AND METALS

(According to The Wall Street Journal, July 17, 1944)

	Net Tons
Aluminum (refined)	155,050
Antimony ore	18,363
Asbestos	20,996
Bauxite	2,829,697
Beryllium ore	3,739
Bismuth	453
Cadmium	836
Chrome ore	1,051,651
Cobalt (ore and oxide)	1,113
Cobalt-nickel compound	45
Columbite	10
Copper (anode scrap)	1,780
Copper (refined and blister)	263,959
Copper ore	155,367
Corundum ore	1,384
Cryolite ore	38,515
Ferromanganese	4,960
Ferrovanadium	644
Fluorspar	60,604
Fluorspar ore	12,164
Graphite	7,853
Iron (Carbonyl)	150
Lead (bullion)	34
Lead (refined)	174,101
Lead ore	5,983
Manganese iron ore	6,548
Manganese (Electrolytic)	200
Manganese ore	1,073,468
Mercury	2,929
Mica (amber phlogopite block)	64
Mica (muscovite block)	3,076
Mica (amber phlogopite splittings)	144
Molybdenite	2,209
Monazite sand	3,188
Nickel (copper-refinery residues)	723
Nickel (refined)	851
Quartz crystals	2,733
Rutile ore	2,230
Talc	96
Tantalite	389
Tin (reclaimed)	1,011
Tin (refined)	44,558
Tin ore	117,675
Tin oxide	893
Tungsten ore	19,080
Vanadium (concentrates)	1,698
Vanadium (lead vanadate ores)	1,121
Zinc (concentrates and ore)	511,690
Zinc metal	196,681
Zinc (sulphide)	15,437
	Troy Ounces
Iridium	2,453
Osmiridium	49
Osmium	85
Palladium	174
Platinum	58,763
Rhodium	105
Ruthenium	21

EXIDE ANNOUNCES A NEW MOTIVE POWER BATTERY

the EXIDE-POWERCLAD

MADE AVAILABLE NOW to relieve existing shortages, and to supplement the Exide-Ironclad, which will continue at peak production

FOR 34 YEARS Exide-Ironclads have been recognized as the world's most dependable and efficient motive power battery. As a natural consequence the demand for them has grown to a point where production has now reached its peak. An increase will not be possible for some time to come. To relieve this shortage another truly great motive power battery has been added to the Exide line.

This new battery, the Exide-Powerclad, is not a stop-gap—not a "Victory" model—nor a composite of other battery parts. It is an entirely new battery—a result of approximately 12 years of specific and definite research, conducted for the purpose of developing a high-quality, flat-plate battery which will meet the most exacting needs encountered in motive power service. Its essential parts are of new, improved design, and are made exclusively for the Exide-Powerclad.

Based on extensive laboratory and service tests, we can assure motive power operators that performance and power costs will compare favorably with those of Exide-Ironclads. For further particulars write to Exide.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

PERSONAL NEWS

Gustavo P. Serrano, Mexican mining engineer, for several years president of the Mining Chamber of Mexico, Gante, No. 15, Mexico City, has become Secretary of National Economy. He heads an important Mexican government department under the direction of which mining is included. He was appointed by **President Manuel Avila Camacho** to succeed **Francisco Javier Gaxiola, Jr.,** resigned. Ing. Serrano was born at Altar, Sonora, Nov. 23, 1887. He is a graduate of the National University of Mexico's school of mines. Among other high Mexican government posts he has held were that of Secretary of Communications and Public Works and Ambassador to Guatemala.

F. W. McQuiston, Jr., chief metallurgist for Empire Star Mines Co., Ltd., a Newmont subsidiary, recently returned from Arizona to his Grass Valley, Calif., headquarters. Mr. McQuiston has been acting as consultant on milling and metallurgical problems at the new 2,500-ton copper-molybdenum concentrator at Hillside, Ariz.

B. N. Sharp, formerly manager of the Richmond mine, at Saltese, Mont., is now general manager of mining development on the Snowshoe group of claims at Libby, Mont., for the Standard Silver-Lead Co., of Spokane.

P. D. I. Honeyman has been advanced to assistant general manager of Inspiration Consolidated Copper Co., at Inspiration, Ariz. **H. C. Weed** has become general superintendent; **C. G. Stunz,** assistant to the general manager; **J. R. Watts,** assistant mine superintendent, at **Bruce B. Whitney,** general mine foreman.

Robert W. Hughes has been made general manager of Miami Copper Co. and its subsidiary, Castle Dome Copper Co., at Miami, Ariz., succeeding **A. S. Winther.**

Theodore A. Luhtanen was recently appointed safety inspector for the Vermilion Range iron mines of Oliver Iron Mining Co.

Tom Lyon is now assistant general manager of International Smelting & Refining Co. He was formerly the company's chief geologist.

Edgar J. Carrington, mining engineer, has joined the staff of Oliver Iron Mining Co. at Ely, Minn.

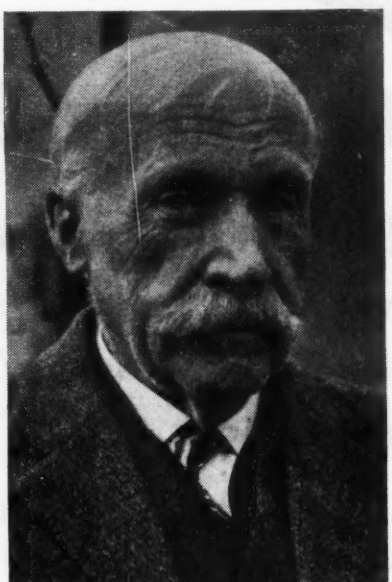
Wesley P. Goss was recently appointed general manager of Magma Copper Co. at Superior, Ariz., succeeding **Edward G. Dentzer.**

William J. Priestley has been elected president of Electro Metallurgical Co., Electro Metallurgical Co. of Canada, Ltd., Michigan Northern Power Co., and Union Carbide Co. of Canada, Ltd., all of which are units of Union Carbide & Carbon Corp. Mr. Priestley succeeds the late Francis P. Gormely.

Arthur Crago has been appointed manager of the phosphate rock production operations of American Cyanamid Co. He will be in charge of, and will have full responsibility for, all of the company's activities in the Florida phosphate rock field, with headquarters at Brewster, Fla. Mr. Crago has had wide experience in the phosphate rock mining industry. Previous positions include manager, Phosphate Recovery Corp., Mulberry, Fla.; manager, Phosphate Mining Co., Nichols, Fla., and assistant superintendent of U. S. Phosphoric Products Division of Tennessee Corp. at Tampa.

Dr. Gerald F. Loughlin, for the past nine years chief geologist of the Geological Survey, has accepted an appointment to the newly created position of special scientist in the Survey, and ha

CENTENARIAN



ROBERT HALOWELL RICHARDS

Robert Halowell Richards, professor emeritus of mining engineering at Massachusetts Institute of Technology, will celebrate his one-hundredth birthday on August 26, 1944. He is the oldest living graduate of the Institute, having enrolled in the first class in 1865, and being one of the first group to receive the B.S. degree in 1868. In the course of his long career at Technology his name became synonymous, not only with that of his *alma mater* but also with the art of ore dressing, a subject to which he made many notable contributions and practically devoted his life.

Professor Richards was born at Gardiner, Maine, where he spent his boyhood. At 13 he went to England to school for five years. Returning to the United States he continued his education at Exeter, but found little interest in classical studies. In 1865 he learned that William Barton Rogers was starting a scientific school in Boston, and without further inquiry he entered the newly established Institute, where he found delight in scientific and technical studies.

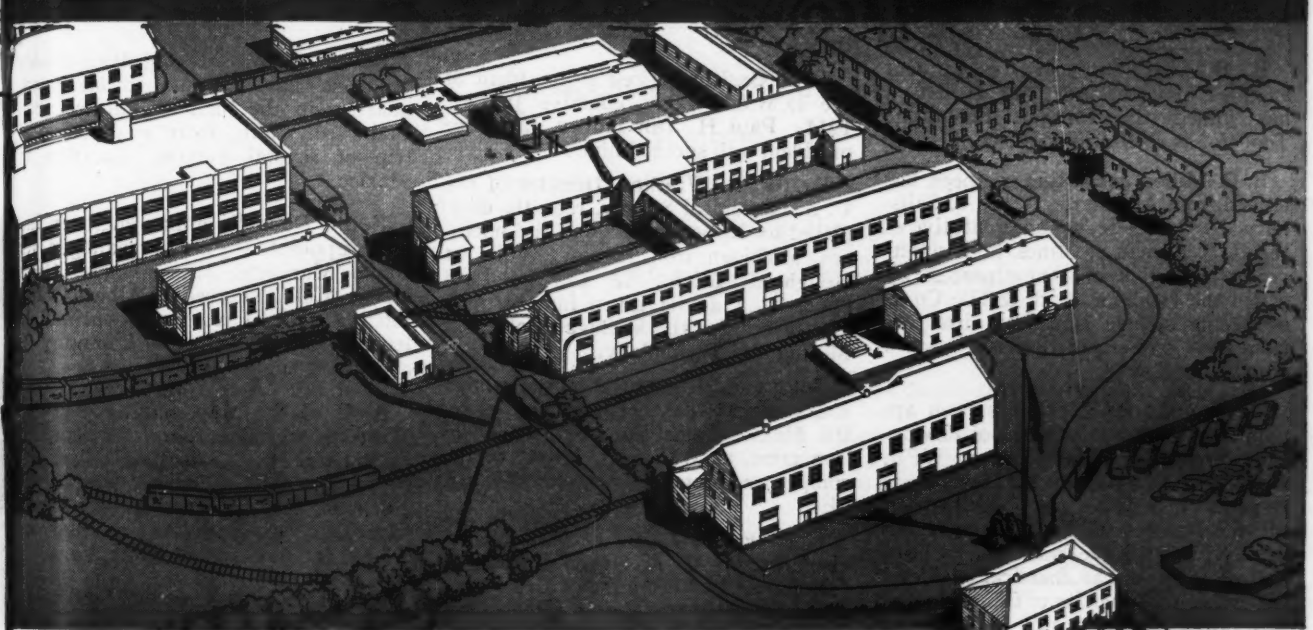
After graduation Richards became successively assistant in general chemistry, instructor in assaying and qualitative analysis, assistant professor of analytical chemistry, professor of mining and assaying in charge of the mining and metallurgical laboratory, and finally in 1873 professor of mining engineering, with the laboratory still under his direction. He retired as professor emeritus in 1914 after teaching for 46 years.

The development of the mining course and the evolution of the laboratory at Technology became his life's career, and to them he devoted his energy and resourcefulness. The work was largely of a pioneer nature, because few precedents existed for teaching mining, and practically none for the development of the laboratory. The basic philosophy of his teaching is expressed in his statement: "Throughout my whole life I have learned more by doing things than in any other way."

He was a voluminous author and will be long remembered for his four-volume work on Ore Dressing, as well as for his inventions in that field. His achievements were recognized in 1915 by the award of the gold medal of the Mining and Metallurgical Society of America, and in 1911 by election to honorary membership in the A.I.M.E.

Few mining educators have exerted a wider influence or enjoyed the respect and affection of more students, to whom he was always familiarly known as "Bobby." The accompanying photograph was taken at Warrenton, Virginia, December, 1924.

AGAIN *GENERAL CHEMICAL* CREATES NEW FACILITIES FOR BAKER & ADAMSON PRODUCTS TO SERVE AMERICAN INDUSTRY!



New B&A Plant, Marcus Hook, Pa.

THESE NEW FACILITIES for production of Baker & Adamson reagent and fine chemicals provide ideal manufacturing areas, additional research and development laboratories, and special storage and shipping accommodations. This plant's output, coupled with that of other Baker & Adamson producing units and distributing stations throughout the United States, marks another forward step in Baker & Adamson leadership.

Basic materials for many Baker & Adamson quality products made here come directly from sixteen of General Chemical Company's producing locations. With such fundamental sources of supply, including many Company-owned mines for raw materials, Baker & Adamson is in a pre-eminent and unique position for meeting the expanding uses of high-purity chemicals in industry.

Whether you require laboratory reagents, fine chemicals, or other products prepared in accordance with your formulae—avail yourself of the Baker & Adamson facilities. Experienced technical service representatives are ready to discuss *your* chemical problems and requirements. Baker & Adamson stocks are carried in many principal cities!

GENERAL CHEMICAL COMPANY

Fine Chemicals for Industrial America

been relieved of administrative duties in order to devote himself to research on special problems in the field of economic geology. **Dr. Wilmot H. Bradley,** for the past two years in charge of the military geology unit of the Geologic Branch, succeeds Dr. Laughlin as chief geologist of the Survey.

J. F. Grill and **E. Cottrell,** of Zinc Corp., Ltd., Broken Hill, Australia, have been inspecting mines of the Pacific Northwest, showing special interest in zinc producers.

Robert G. Vervaeke, mining engineer of Colville, Wash., and former head of the Stevens County Mining Association, is engineer and geologist for U. S. Gypsum Co., at New Braunfels, Texas.

E. B. Lear, formerly development engineer of Cleveland Rock Drill Co., has joined the Chicago Pneumatic Tool Co. as rock-drill engineer.

B. C. Miller, consulting engineer, has moved from Albemarle, N. C., to Salisbury, N. C., where, as representative of the U. S. Bureau of Mines, he is supervising perfection of a new process by which the Isenhour Brick & Tile Co. is producing sponge iron from iron ore from the Cranberry deposits in western North Carolina.

Dr. Donald B. Keyes has been appointed director of the Office of Production Research and Development, WPB, succeeding **Dr. Harvey N. Davis,** who resumes his duties as president of Stevens Institute of Technology, Hoboken, N.J. Dr. Keyes was formerly head and professor of the chemical engineering division, University of Illinois. The metallurgical activities of OPRD have included the review of about 50 processes for extracting alumina from low-grade materials, and the testing of marginal ores of manganese, chromium, tungsten, vanadium, and copper.

W. S. Murphy, chief of the Gold and Silver Section of the Miscellaneous Minerals Division, WPB, has resigned to return to private business.

F. S. Elfred, Jr., has succeeded **R. E. Phelan** as general manager of Kalunite Inc., of Salt Lake City. **Sherwin P. Lowe's** former position as plant superintendent was abolished. **S. J. Burris,** Jr., consulting engineer at Kalunite, Inc., since 1942, was made general superintendent. **Dean Hurd,** formerly general foreman, was made mill superintendent.

F. S. Mulock, vice president and general manager, United States Mining, Smelting & Refining Co., Salt Lake City, is the new president of the Salt Lake Chamber of Commerce.

George Fisher, lately underground manager of Zinc Corporation Ltd., Broken Hill, has been made assistant superintendent.

H. St. J. Somerset, general manager of Electrolytic Zinc Co. of Australasia Ltd., has been elected president of the Australian Mines and Metals Association in succession to the late **Sir Colin Fraser.**

H. Foster Bain lately recounted his experiences as a prisoner of the Japanese at Santo Tomas prison, near Manila, in addressing the Southern Nevada Technical Society at Boulder City, Nev. He is now living at his ranch home near Steamboat Springs, 14 miles south of Reno, Nev.

Ott F. Heizer, manager during more than 20 years for the Nevada-Massachusetts Co. at Mill City, Nev., has retired from active duty and is moving to the Pacific Coast. He is succeeded as manager by **W. Glenn Emminger,** long general superintendent for the company.

C. E. Carlson retired as president of the D.M.&I.R. Ry. effective June 1, 1944. **Paul H. Van Hoven,** first vice president will succeed him.

Dr. W. E. Wrather, Director of the U. S. Geological Survey, recently completed an inspection trip to the northern Michigan iron ranges. While at Houghton, Mich., he was guest of honor at a dinner given him by men associated with the Michigan College of Mining and Technology.

Robert S. Kroger, mining engineer and geologist, has been transferred by the M. A. Hanna Co. from Wakefield iron mine, at Wakefield, Mich., to the company's properties at Iron River, Mich.

J. H. Reeder, until recently supervisor for the M. A. Hanna Co. of the Manganese Ore Co. mine at Las Vegas, Nev., has been transferred to the company's Clifton mine division as superintendent at DeGrasse, N. Y.

James G. McCrae has been appointed general manager of the Indian Molybdenum, Ltd., property near Cadillac, Quebec. He has been directing exploration at the property for some time.

Robert Annan has been made chairman of the board of Consolidated Gold Fields of South Africa, Ltd., and New Consolidated Gold Fields, Ltd.

M. A. Mawby, formerly mill superintendent of Zinc Corporation, Ltd., Broken Hill, has been appointed chief metallurgist of the company and manager of New Broken Hill Consolidated, Ltd.

F. G. Brinsden, general manager of South Kalgurli Consolidated, Ltd., also consulting engineer to North Kalgurli (1912), Ltd., has been appointed to act temporarily as manager of the latter mine, in addition to his present positions.

A. B. Grafius has retired as vice president of Coronet Phosphate Co. after 27 years of service. He will continue to act as a director of the company.

Dr. Stephen W. Nile, former assistant professor of physics at Reed College, Portland, Oregon, has accepted an appointment as assistant professor of physics and acting head of the department at Montana School of Mines, succeeding **Dr. Daniel Q. Posin,** who recently resigned. Dr. Nile, who received his B.A. from Reed College and his Ph.D., from New York University, has had many years' experience as an instructor and a writer.

D. S. Coulter was recently appointed general manager of Silbac Premier Mines, Ltd. (Premier, B. C.). He succeeds the late Bert F. Smith.

William F. Hayden, consulting mining engineer, recently returned to his St. Louis (Mo.) office after a month spent in New York City on professional work.

Edward H. Wisser, consulting mining geologist, has returned to his headquarters in the Sharon Building, San Francisco, Calif., from a professional trip of several months' duration in Mexico.

Neil O'Donnell, mining engineer, has been appointed general manager for Idaho Maryland Mines Corp., Grass Valley, Calif., succeeding **Albert Crase,** retiring. Mr. Crase will continue to lend his services to the company as consulting engineer.

A. J. (Jack) May, mining engineer, Western division, American Smelting & Refining Co., Salt Lake City, has been appointed superintendent of the Buchans Mining Co., zinc-lead-gold-silver-iron ore producer owned by A.S&R. at Buchans, Newfoundland.

M. H. Kuryla, Boston, president, United States Smelting, Mining & Refining Co., visited the company's Utah operations late in June.

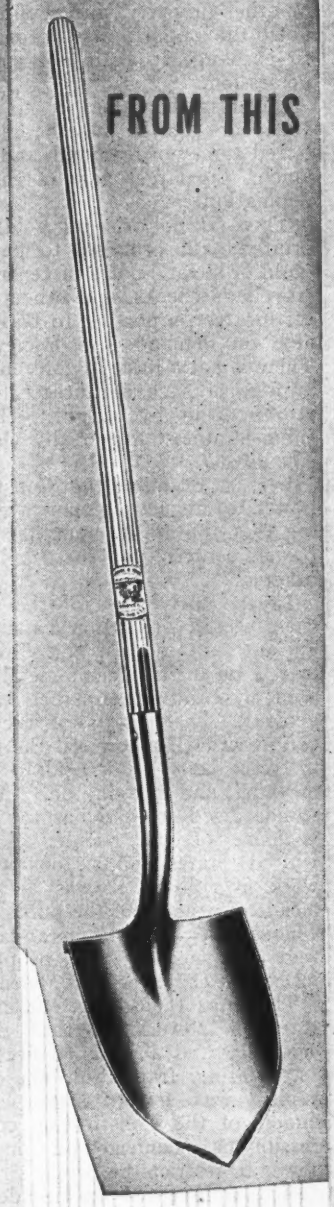
Dr. L. W. Eastwood, formerly vice-president of Maryland Sanitary Manufacturing Co., has been named to the staff of Battelle Institute, Columbus, Ohio, where he is engaged in metallurgical research. Dr. Eastwood is a graduate of the University of Wisconsin, from which he received Bachelor of Science, Master of Science, and Doctor of Philosophy degrees in metallurgy.

Eugene M. Smith, metallurgist, has been appointed to the staff of Battelle Institute, Columbus, Ohio, where he will be engaged in research in nonferrous metallurgy. Mr. Smith, who was formerly with the Aluminum Co. of America, is a graduate of Lehigh University and has studied at the University of Pittsburgh.

OBITUARIES

Joseph McClintock Garris, for many years manager of the sling division of **Macwhyte Co.,** Kenosha, Wis., died recently.

Bert F. Smith, mining engineer, who had been manager of Silbac Premier



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MO-LYB-DEN-UM
ALLOY
SHOVELS

Mines, Ltd., in the Portland Canal district of British Columbia, since 1936, died at Premier on June 19, at the age of 55. He was an alumnus of the University of Idaho and formerly had been associated with A.S.&R. in exploration work. He was a member of the A.I.M.E. and several Canadian mining associations and civic bodies.

Joseph James Battershill, 66, retired mining expert of South Boston, Va., died at Durham, N. C., on July 15.

Francis Patrick Gormely, president of Electro Metallurgical Co., Haynes Stellite Co., and other units of Union Carbide & Carbon Corp., died at his home in New Rochelle, N. Y., July 13. He was 56 years old.

Edwin C. Holden, consulting mining engineer, of Baltimore, Md., died on June 21 last at the age of 71. He was a member of the A.I.M.E.

Walter Lampton Reid, retired metallurgical engineer, died on June 10, at Los Angeles. He was born in Grundy County, Mo., Aug. 17, 1875.

J. G. Clark, 73, a mining man with interests in Colorado, Arizona, and Nevada, died at Boulder, Colo., on July 25.

Victor T. Edquist died on May 4 last at the age of 65. He was a leader among Australian metallurgists. The greater part of his professional life was spent in Western Australia, mainly on mines controlled by Bewick, Moreing & Co., the principal being the Great Fingall and the Sons of Gwalia.

Gordon Bettles, mining engineer long active in Nevada and California, died a year ago in a Japanese prison hospital near Manila, according to word transmitted by the Red Cross to Mrs. Bettles at her home in Nevada City, Calif. He had been in the Philippines for several years and had just taken charge of a large gold property when the Japs occupied the Islands.

William J. Halloran, former director of Silver King Coalition Mines Co. and trust company founder, died in Salt Lake City June 29 aged 84.

Dr Gustave Lind, instructor-emeritus at Weber college, Ogden, Utah, who started as a tool nipper in mines at Park City, Utah, died in Ogden June 28, aged 77.

Frank D. Aller, retired Colorado mining man, died during the latter part of June, at his home in Golden, Colo. Mr. Aller worked for the Guggenheims, first at the Philadelphia smelter, Pueblo, Colo., and later in Chile. He served as U. S. Consul at Antofagasta during the first World War and subsequently was on the faculty of the Colorado School of Mines.

Alexander P. Malozemoff, consulting mining and metallurgical engineer, who maintained an office at 63 Wall St., New York City, died on July 13 in New York at the age of 65. He was born in Russia and educated at the Mining Institute of St. Petersburg, also in Belgium, and at the Mining Academy of Frieberg. He started his career as an engineer at the Simsky district iron and steel works in the Ural Mountains. In 1908 he was exiled to Siberia by the Czarist government, and there took part in the development of the gold mining industry. In 1917 he was made general manager of the Lena Gold Fields in eastern Siberia. He came to the United States in 1919 and became an American citizen in 1926.

Edwin M. Rogers, a retired mining engineer, died in New York on July 23, aged 85. Mr. Rogers was an outstanding and capable engineer, of considerable importance in his day, and was active generally in Western mining. During his early activities he lived in Central City, Colo., in which State his family was identified in pioneer mining enterprises. He graduated from Sheffield Scientific School, Yale University, in 1880, and began practicing his profession in Colorado. In 1892, or thereabouts, he became associated with D. M. Hyman, and from then on he was engineer for Durant and Smuggler mines and for other mines at Aspen, Colo. Later Mr. Hyman and he became interested in mining in Arizona, where they opened a gold mine, which they operated successfully for years. Mr. Rogers was granted a number of patents for air lifts for the dewatering of mines.

LETTERS

Right to Manipulate Money Questioned

The Editor:

THE DISCUSSION OF GOLD AND SILVER MONEY is most valuable and I have noted many enlightening comments in the letters you have published.

Probably there is general agreement among public-spirited people that the present system of alleged money imposed upon us by senseless and damaging acts of Congress is wrong, and can only lead to disastrous consequences to our country, unless remedied in time.

The individual loss and discouragement meted out to the owners of a gold-producing property and to the miners who have committed themselves to this mining may be of monumental size to them individually, but the sum total of injury to them is a mere fraction of the sum total of the injury to a defrauded and deceived public. The discussion among mining men will be completely fruitless unless by some means the general public can be informed that dishonest money hurts them and is designed for that purpose.

Even among people primarily interested in the production of civilization's first necessity, money for exchange purposes, there is an amazing persistence in referring to the "price of gold." Gold has no price and no value but its own. It is, as it has been for thousands of years, a material for which a man would be willing to sell his home, or his farm, or other property, and retain the gold until the opportunity or desire arose to exchange it again for some other possession.

Silver is the same: up to less than 100 years ago it was the rather preferred money of mankind, and is today, among the larger part of the world's population.

There is no price of gold. Papers printed with promises to pay money (gold or silver), notes of central banks, traveller's checks, and others are only certificates purporting to be exchangeable on demand into money, metal. There is not a price of gold but there is a price of such certificates, promises, etc. in gold by weight. The whole thing is almost universally viewed upside down.

Let us examine the Constitutional power to "regulate money," remembering that the government has only the powers conferred by the people and no others.

In the early days of the Republic there was in circulation a multitude of ancient and modern coins all valued merely on their precious-metal content. Such a medium of exchange was inconvenient. The writers of the Constitution wisely empowered the Congress to pass laws to "regulate money" meaning, and meaning only, to issue a standardized set of coins for the convenience of the people. When the United States mints took over the work of coinage it was an effective means of promoting the public welfare. Thereafter experts in coins and exchange were not needed: the people could just count the coins in confidence.

That was the sole intention of this grant of power. At that time the ingenuity and avarice connected with perpetrating frauds on the people's money was not dreamed of. The signers of the Constitution could not possibly have conferred on Congress the power to restrict the people's rights by devices uninvented for decades thereafter. How they could confer a right to do a thing that had not even been dreamed of?

ANSON G. BETTS.

West Cummington, Mass.

Patents on Briquettes

The Edilor:

IN THE APRIL AND JUNE 1943 ISSUES of Engineering and Mining Journal and also the May 1944 issue, I noticed some very interesting articles on iron ore briquetting which described processes for making iron ore briquettes by high pressure and also hardening the same by sintering; the latter according to U.S. Patent 2,331,074.

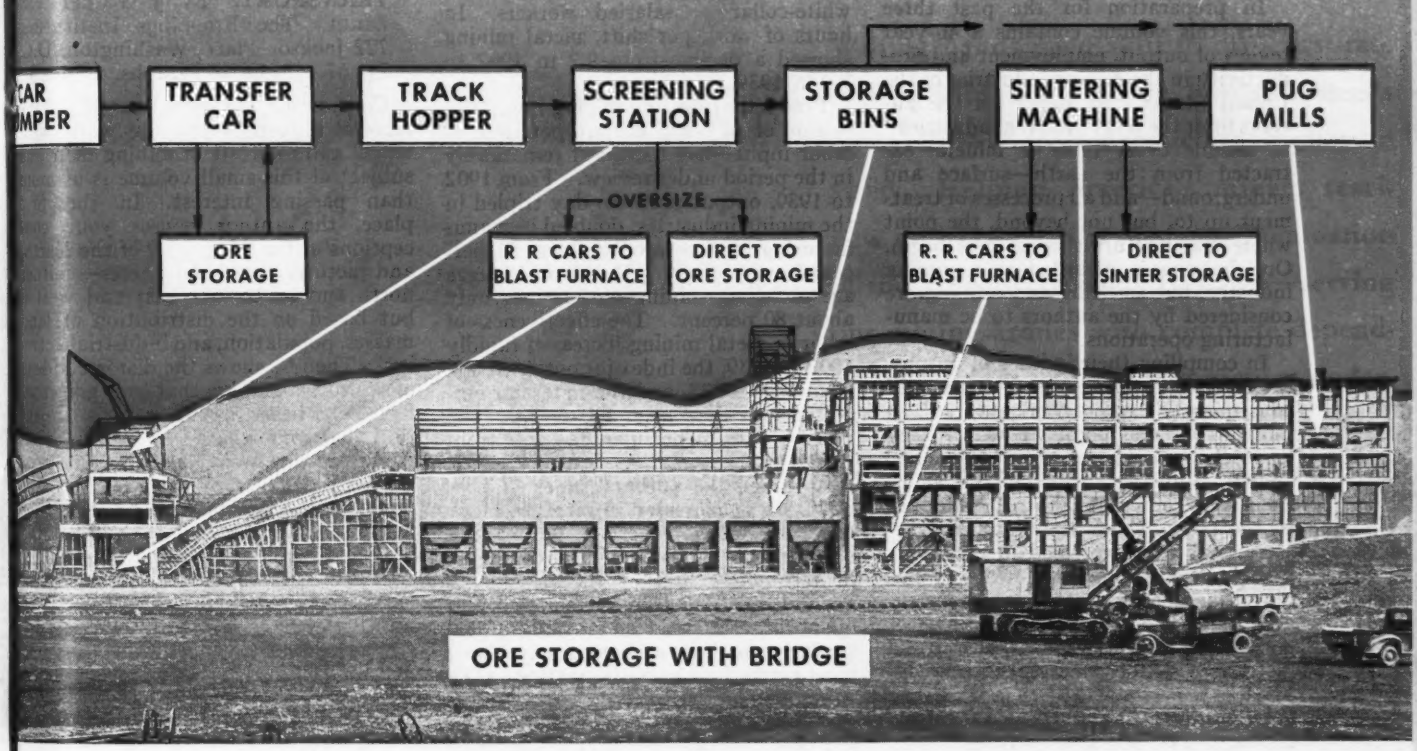
In 1928 I was granted U.S. Patent 1,655,981 on the "Process of Making Briquettes Containing Phosphate Rock" (assigned to International Agricultural Corporation) from which I quote as follows:

" . . . a superior product may be had if briquettes, so formed, are heated

Continued on page 152

Modern Screening and Sintering Plant

Designed and built by Arthur G. McKee & Company for Wheeling Steel Corporation



ORE STORAGE WITH BRIDGE

THE photograph reproduced above shows a modern sintering plant under construction by McKee for Wheeling Steel Corporation. This plant was completed and placed in operation in July.

As indicated by the accompanying flow sheet this plant is built on a simple, straight-line design and provides complete facilities for ore handling and preparation including ore yard, car dumper and storage facilities. The sintering machine is 6′ wide by 89′3″ long and has 14 windboxes.

The design of this plant is based on a complete study of raw materials, blast furnace requirements and seasonal shipment and storage of ores. Since all materials are received in railroad cars an analysis and flow sheet of all car movements of each ore during shipping and winter seasons was necessary.

Construction of buildings is entirely of concrete to comply with wartime restrictions. Simplicity and ruggedness of plant and equipment have been emphasized throughout.

Arthur G. McKee & Company

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COMMERCE BUILDING
HOUSTON, TEXAS

NEW BOOKS

THE MINING INDUSTRIES, 1899–1939: A STUDY OF OUTPUT, EMPLOYMENT AND PRODUCTIVITY. By Harold Barger and Sam H. Schurr. National Bureau of Economic Research, New York. Pp. 452. Price $3.

In preparation for the past three years, this volume contains a 40-year review of output, employment and productivity in the mining industries of the United States. By definition the authors limit the term "mining industries" to include every form of mineral extracted from the earth—surface and underground—and all processes of treatment up to, but not beyond, the point where manufacturing operations begin. Ore dressing is regarded as a mining industry, but smelting and refining are considered by the authors to be manufacturing operations.

In compiling their indexes of output, the authors use prices as weights, and consequently express "mine value" of minerals at the point at which they leave the mining operation as defined above. Similarly with employment, their data represent labor expended up to the point where manufacturing begins. Labor is expressed in man-days rather than in number of workers employed because the latter figures fluctuate widely and give a distorted idea of labor input. Productivity is expressed in terms of labor only, and ignores the impact of technologic progress and such economic factors as tariffs, labor legislation, and conservation policies.

The authors' index of mining output for the forty-year period under review —taking 1899 as 100—shows that the production of minerals has outstripped the increase in population. From 1899 to 1929, mineral production increased roughly four-fold. Metals showed a slower growth than fuels or non-metals. The sensational growth of petroleum and natural gas production is mainly responsible for the increased output of mining as a whole, and has outweighed the actual decline in older forms of mineral extraction.

As a source of livelihood the mining industries of the United States are of relatively minor importance, employing only about two percent of the working population and producing less than two percent of the national income. Still, the industries' products are of prime importance to the national economy.

Striking changes have occurred in employment in mining between 1902 and 1939. While total employment apparently rose about 5 percent, metal mine employment declined 24 percent and non-metal 18 percent. In the production of fuels, however, employment expanded 17 percent. A significant change has also occurred in the ratio of salaried workers to wage earners. In 1902 the ratio was 1 to 15, but in 1939 it has risen to 1 to 10. This is due in part to the mechanization of the wage earner's work; also to the increasing burden on management of modern productive processes which calls for more white-collar or salaried workers. In hours of work per shift, metal mining showed a decline from 9.2 in 1902 to 7.9 in 1939.

Productivity in the mining industries —unit of physical output per unit of labor input—has increased remarkably in the period under review. From 1902 to 1939, output per man-day tripled in the mining industries, doubled in manufacturing, and rose only about 50 percent in agriculture. But if oil and gas are excluded, mining output rose only about 80 percent. The effectiveness of labor in metal mining increased rapidly 1902 to 1939, the index for output rising from 100 to 183, and the index for employment falling from 100 to 73. The index of output per man-day rose from 100 to 251.

Although the authors' index of productivity is expressed in terms of labor only, they do not overlook the marked effect on the industry of improvements in technology and of the growth of open-pit mining relative to underground operations. It is in metal mining particularly that these changes have been most marked. Open-pit practice on the Mesabi iron range was adapted to the exploitation of Western porphyry copper ores; but another factor—beneficiation of low-grade ores—was a basic step in the productivity of metal mining. Application of special mining methods to different types of underground ore bodies also played a part in progress. Improved means of drilling and underground loading and transport have vitally affected output and productivity.

The extent to which technological advance can be expected to overcome the effects of inevitable depletion of mineral resources is hard to predict. Thus far technology has performed its task well, but future difficulties will multiply rather than diminish as domestic resources decline.

MINING YEAR BOOK, 1944. Compiled and published by Walter E. Skinner, 20 Copthall Ave., London, E.C.2, England. Pp. 452. Price 26s. 6d., net, post free abroad.

Despite difficulties imposed by the war, the publisher of this standard reference work has succeeded in producing a creditable volume. Complete and up-to-date particulars are given concerning 810 companies operating in all parts of the world, together with a list of names and addresses of 870 mining engineers and mine managers and the companies with which they are connected. The book will have its customary high value for all who want reliable information on the leading mining companies.

THE GEOGRAPHY OF WORLD AIR TRANSPORT. By J. Parker Van Zandt. The Brookings Institution, 722 Jackson Place, Washington, D.C. Pp. 67. Maps and graphs. Price $1.

Considering the global extent of the mineral industries and the world-wide travel and interests of mining men, the subject of this small volume is of more than passing interest. In the first place, the author revises your conceptions of the geography of the Earth, and pictures new hemispheres—neither north and south, nor east and west—but based on the distribution of land masses, population, and industrial activity. Then he shows the distorted ideas of world geography that you got from flat maps based on Mercator's projection that you studied in grade-school. And from this point he leads you into a fascinating study of the revolutionary influence of the airplane and the art of flight on human affairs and global development. This volume is introductory to a series related to international air transport, the growth of which will have increasing importance for the mining industry.

PUBLICATIONS RECEIVED

The Western Steel Industry. By J. R. Mahoney, Director, Bureau of Economic and Business Research, University of Utah, Salt Lake City. A study of economic and material factors affecting the postwar operation of Geneva, Utah, Steel Plant.

U. S. Geological Survey

Mifflin-Cokerville Area, Wisconsin Lead-Zinc District, preliminary report and map on geology and ore deposits. Available on application to the Director, U. S. Geological Survey, Washington.

Beryl-Bearing Pegmatite, Larimer County, Colorado. Geologic map and report, available on application to the Director, Geological Survey, Washington, 25, D.C.

Vanadium Region of Southwestern Colorado and Southeastern Utah. Simplified geological map, available at 30¢ per copy, from the Director, Geological Survey, Washington, 25, D.C.

State of California

Manner of Locating and Holding Mineral Claims in California. By A. H. Ricketts. Bulletin No. 127, Division of Mines, Ferry Bldg., San Francisco.

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REGIONAL NEWS

The town of Juneau, Alaska, with the Alaska Juneau mine and waste dump in background. The shutdown of the mine because of a WLB mandate to raise wages to unbearable levels will have an adverse effect on the community.

ALASKA

WPB permits resumption of gold mining—Geological Survey parties active

★B. D. Stewart, Coordinator of Mines in Alaska, reports that WPB has granted an expansion of gold mining for specific companies which will bring the number of crews up to 75, aggregating 771 men. These crews may range from 14 to 200 men. Dredging companies which have been authorized to make these increases are Livengood Placers, Inc., at Livengood; New York Alaska Gold Dredging Corp., at Nyac; Wallace Porter, at Haycock; and U. S. Smelting, Refining & Mining Co., with one dredge authorized at Nome and two dredges at Fairbanks. All permits specify that only men not required in essential war activities may be employed, and only those critical materials already on hand, or available as second hand, may be used.

★Robert R. Coats of the U.S.G.S., and formerly faculty member of the University of Alaska, will spend this season doing geological work on the upper Colville River. He said Robert M. Chapman will study coal deposits near Nulato and Unalakleet, and later examine asbestos deposits in the Kobuk district being developed by James Robbins, who has opened a body of tremolite.

★Livengood Placers, Inc., is maintaining its dredge in readiness and reports that the spring break-up caused no material damage to unfinished structures. The company reports a net loss last year of $8,073, a profit on the sale of equipment and supplies of $2,322, and that $6,560 was received from rentals of buildings and equipment.

★The U. S. Bureau of Mines reports that the Poor Man iron deposit on Kasaan Bay, 35 miles northwest of Ketchikan, contains ore that averages 54.4 percent iron and 0.25 percent copper, with some gold and silver. The deposits contain phosphorous and titanium but not in harmful quantities, and a sulphur content of 3.72 percent. Iron-copper deposits in the Rich Hill district, on Prince of Wales Island, 35 miles southwest of Ketchikan, are at the top of a hill 500 ft. high and a quarter of a mile from tide water. The U.S.G.S. estimates 27,000 short tons of ore that averages 1.5 percent copper in the Rich Hill mine. The Survey has reports and maps on these explorations.

★W. S. Pekovich is returning to Hawk Inlet to resume operations of the Alaska Empire Gold Mining Co. He has been manager since 1932. He plans the installation of a power plant that will operate a mill of 50 tons daily capacity throughout that part of the year when there is a sufficient water supply. He reports that up to 1941 the mine averaged a recovery of $9 per ton and in that year a shaft was sunk opening ore that yielded $21 per ton. It is claimed $250,000 has been taken from the property. The workings are about 1,000 ft. above sea level and are reached by a road a mile and a quarter long. A permit has been secured from the government authorizing this operation.

★Don J. Miller, Darwin L. Rossman, and Charles A. Hickcox, geologists from the U. S. Geological Survey at Washington, are the first of four parties that will investigate oil possibilities at Katalla, Cold Bay, Wide Bay, and Iniskin Bay, the first three being in the Kenai and Aleutian peninsula districts. They arrived at Cordova in June. The Geological Survey is making these studies while the Navy has the task of investigating Barrow oil possibilities.

★Carl Whitham, president and manager of Nabesna Mining Corp., has been inspecting the company's property in central Alaska to determine whether work shall be resumed when the ban on gold mining is removed. The property is on the north border of Wrangell Mountain 200 miles northeast of Valdez. Although the chief orebodies are supposed to be worked out, U. S. Geological Survey is expected to investigate some of the nearby properties.

★Don Gustafson and Mrs. Gustafson have returned by plane to Fairbanks where she will spend most of her time while he is inspecting his extensive mine holdings. While his operations are suspended because of the ban on gold mining he is looking forward to the time when the ban will be lifted.

★Alaska Miners' Association, Charles Johnston, president, has appointed a committee of six members to nominate directors from the membership, five to be chosen from each of the five districts in the Territory. Glenn Carrington is chairman of the committee, and its members are R. A. Wyer, for the Fairbanks district; Harold Strandberg, Anchorage-Willow Creek district; Fred Dent, Yukon-Kuskokwim district; Alex Mathieson, Seward Pen. district, and Joe Williams, southeast Alaska.

WASHINGTON

Resources of Metaline district being investigated—Bureau of Mines drilling Chelan nickel

★R. S. Dean, Assistant Director of the U. S. Bureau of Mines, visited the Metaline district in June and said the most thorough investigation of resources in the Northwest is in progress in that district. He also stated the results already obtained warrant continuation of the investigation by the Bureau of Mines and the U. S. Geological Survey. As a result of his statement one or more zinc-producing corporations

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Washington (*Continued*)

of the United States are reported to be putting men in the field to determine whether they should go into that district. These engineers have visited the Gardner Cave area, north of the holdings of the Pend Oreille Mines & Metals Co., on the west side of the Pend Oreille River, and also the Slate Creek area east of the river.

"The Metaline district will develop into one of the principal zinc-producing sections of the nation," Dr. Dean predicted. "The Bureau is very much interested and is studying the possible extent of the already known deposits. The combined zinc and lead contents of the ores of the district will average 5 to 7 percent."

★Pend Oreille Mines & Metals Co. has reelected Lewis P. Larsen, president, and Jens Jensen, secretary, both of Spokane, for another term. Officers reported that during the year ended April 30, the company produced zinc and lead concentrates worth $844,157 from its property in the Metaline district. This production amounted to 12,295 dry tons of concentrates with a metal content of 5,218,860 lb. of lead and 11,040,880 lb. of zinc, the average assays being 76.61 percent for lead concentrates and 60.66 percent for zinc concentrates. Tonnage mined was approximately 10 percent less than the previous year, due to manpower shortage. The company at present is able to secure only half the men desired. Its hydro-electric plant operated continuously and generated 8,198,000 kw-h. Operating profits before deductions amounted to $241,208.54 and net profits to $46,966.22. Dividend No. 3, of 6c., amounting to $97,938, was paid last year, and the same amount in July this year.

★Louis H. Schermerhorn, president of Metaline Mining & Leasing Co., said at the annual meeting in June that net earnings of the company are running $10,000 to $15,000 monthly. "Diamond drilling has greatly improved the prospects of the company's property," he said, "showing two fine orebodies, which are being explored, one showing a metal content of 16 percent and the other 18 percent." General Manager D. I. Hayes stated that development conditions in the mine were somewhat better at the end of the year than at the beginning.

★E. P. Oscarson, of Spokane, regional director of the U. S. Bureau of Mines, reports the Bureau has started drilling operations at the Chelan nickel mine, at Winesap, on the Columbia River. R. H. Storch, mining engineer, is in charge for the Bureau. The work will be done by Longyear Co., of Minneapolis. Mining men hope this work will develop a nickel deposit to supply the United States lack of nickel ore.

★Twelve loans were made by the RFC to aid development of mines and prospects in Washington up to the first of June this year, according to H. P. Sherman, supervising engineer.

The amount allocated to such loans in Washington, and in Idaho, has amounted to $240,000. The amounts of these loans made in the state are as follows: Gladstone, at Leadpoint, $5,000; Bonanza, at Evans, $5,000; Mackinaw Nickel, Snohomish County, $20,000; Willow Creek, Northport, $40,000; Kromona Mines Corp., Sunset, $5,000; Morning Star, Danville, $5,000; Zenith, Cleveland, $4,000; James Keith, Colville Indian Reserve, $5,000; Juno-Echo, Chewelah, $5,000; Holden Campbell, Chelan, $5,000; Great Western, Northport, $5,000; Lone Star Lease, Conconully, $5,000. Several of these have since closed.

★Edward W. Jamison and Truman (Cy) Higginbotham, who have been operating the Sierra Zinc property, in the Aladdin district in Stevens County, have added to their operations by taking over the Willow Creek property in that district, in addition to the Van Stone property, at Northport. At the Willow Creek, it is said, two zinc orebodies have been developed and about 75,000 tons of ore has been blocked out. Some diamond drilling is being done. It is said they will suspend operations at the Sierra Zinc this summer, and give their attention to the Willow Creek, which was formerly known as the Deep Creek mine. They will haul this ore 9 miles to the Sierra Zinc mill, which has been operating on a 24-hour basis for more than a year. The plant has been stepped up to 100 tons a day.

★Northwest Mining Association, acting in conjunction with the Mining Bureau of the Spokane Chamber of Commerce, has adopted a resolution reaffirming its demand for bimetallism. The resolution declares that national and international exchange can be sound and stable only when backed by gold and silver. "The production of silver is not likely to be materially increased," says the resolution, "and any increase in production will be offset by the industrial demand, which is already far beyond current production." The resolution was prepared by a committee consisting of Leon Starmont, Roger Oscarson, Frank Lilly and C. O. Dunlop.

★Carl Zapffe, manager of iron ore properties for the Northern Pacific Railroad, addressed mining men of Spokane recently on the character and possibilities of iron ore in the Pacific Northwest. He said these ores have different characteristics than others and should be studied metallurgically to determine their usefulness, and that pilot plants should be built for research.

★Congressman Warren G. Magnuson recently discussed with Spokane mining men changes which are considered necessary in SEC regulations to make the financing of new mining properties easier. "Financing of new mining enterprises has virtually been stopped by over-stringent SEC regulations and by tax policies that remove the incentive for risk," said C. O. Dunlop, former president of Northwest Mining As-

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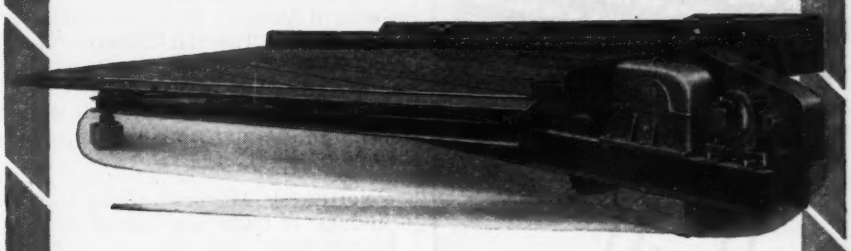

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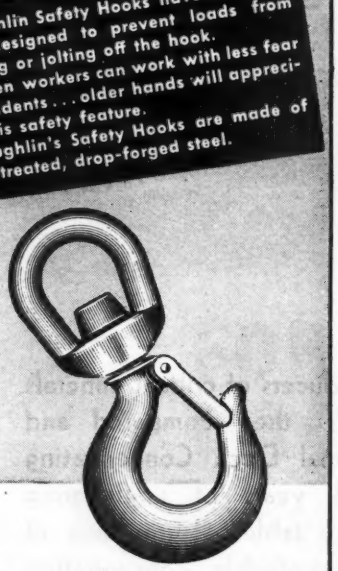

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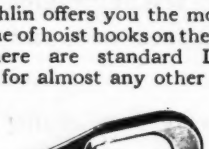

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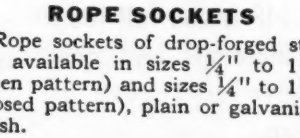

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Washington (*Continued*)

sociation. "One amendment proposed would permit simple qualification by small assessable companies, which now are required to go through the expensive process of complete registration, even when they do not propose to raise more than $100,000 in a year."

★H. G. Loop, Spokane mining man, has established an employment office in Spokane for the hiring of men for the so called "Day-Rothrock" mines in the Coeur d'Alenes. These properties are the Dayrock, Tamarack, Sherman Lead, and Monitor. Union wages are paid: for miners, $8.25; shovelers, $7.75; raise miners, drift miners, and timbermen, $8.75, and sinking shaft men, $9.25.

★Northwest Magnesite Co., heaviest producer of refractory magnesite in the United States, took from its Finch and Allen-Moss deposits, near Chewelah, Wash., production practically equal to its full capacity in 1943, according to a report from the United States Bureau of Mines. Part of the magnesite was purified by froth flotation.

CALIFORNIA

Alaska Juneau subsidiary managing Newton copper mine—Mt. Diablo suspends furnace operations

★Pacific Mining Co., subsidiary of Alaska Juneau Gold Mining Co., is now managing the Newton copper mine for Winston Copper Co. Company engineers, crews, and equipment are on the ground, and ore shipments are to be resumed in a few weeks. The property is near Ione, in Amador County, and has been active since July, 1943, shipping 9½ percent copper ore to a Utah smelter, Wayne Loel, with headquarters in Los Angeles, is president of Winston Copper Co. and P. R. Bradley, Jr., who also manages the Pine Tree, and the Josephine and Harvard mines, in Mariposa and Tuolumne counties, and the Calaveras Copper Venture, at Copperopolis, in Calaveras County, directs operations at the Newton.

★J. A. Hassell and associates of Los Angeles are reported to be planning resumption of mining operations as soon as wartime conditions permit at the Gold Ribbon property at Coarsegold, Madera County, idle since the gold-mine closing order. The mine is equipped with an amalgamation-concentration mill, and a fair tonnage of good milling ore is available. The company also holds under a long-term operating agreement the nearby Texas Flat mine, worked some 56 years ago by the Hearst-Haggin interests.

★A plant for the recovery of zircon, garnet, and ruby from dragline dredge tailings has been placed in operation recently in the Lincoln placer area of Placer County by C. L. Tomlinson.

★Furnace operations have been suspended at the Mount Diablo quicksilver mine, in Contra Costa County, operated by the Bradley Mining Co., Worthen Bradley, president. Current activities are confined to development work, with from four to six men employed.

★Production is scheduled to start soon at the Cerro Gordo lead-silver mine, near Keeler, Inyo County, where a power line has been completed recently and mining machinery installed. The property is operated by the Golden Queen Mining Co., William C. Browning, general manager, under a sublease from Imperial Metals, Inc., of Los Angeles. Silver Spear Mining Co., of Los Angeles, is the owner of the Cerro Gordo holdings. M. Albertoli, superintendent, is in charge of operations.

NEVADA

Metals Reserve ends tungsten operations—U. S. Smelting contracts deep drilling

★Net profit of $34,213 in 1943 is reported by Prince Cons. Mining Co. of Pioche, Lincoln county. Gross income was $395,588 and operating expense, including labor, supplies, taxes and depreciation, $361,374. The company ships about 100 tons of lead-zinc-silver ore per day to the selective-flotation mill of the Combined Metals Reduction Co. David L. Gemmill of Pioche is president and manager. The company is owned jointly by the Gemmill brothers, Combined Metals Reduction Co. and International Smelting & Refining Co.

★A 70,000-ton stockpile of scheelite, said by Metals Reserve engineers to be the largest in the country, situated in the Potosi district near the Getchell mine in Humboldt county, has been closed to further acquisitions and the 400-ton tungsten concentrator of the Getchell Mine Inc. has ceased to operate. Since the Metals Reserve concentrate treatment plant at Salt Lake City has been closed down there is currently no outlet in the west for low-grade tungsten concentrate or for the ores of tungsten. Ore in the Potosi stockpile came from near-by properties of the Getchell Mine Inc., W. C. Rigg, leasing from the U. S. Vanadium Corp.; Joseph Riley and Harold's Club Mining Co. The Getchell plant was said to have treated upwards of 50,000 tons, producing a low-grade concentrate containing some deleterious minerals. No means of disposal is in sight for this stockpiled ore, said to contain more than $1,000,000 worth of WO_3.

★Shortage of miners has compelled the International Smelting & Refining Co. to cut from three to two shifts the operation of its 400-ton flotation mill on the leased copper-gold property of the Copper Canyon Mining Co. in Lander

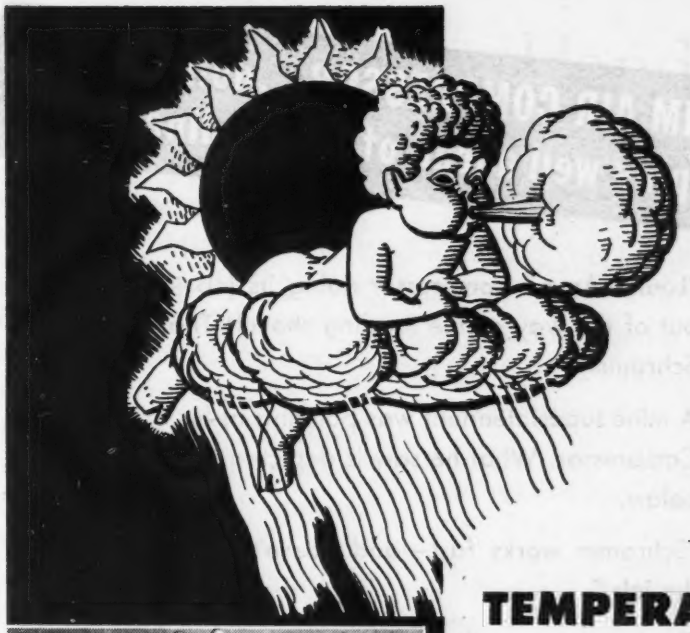
county. J. J. Lillie, manager at Battle Mountain, indicated that unless more miners can be obtained at once, it will be necessary to reduce milling time to a single shift. Concentrate, in which the value of gold exceeds that of copper, is shipped to the International smelter at Tooele, Utah. Mining and deep drilling are now in progress on the 500-ft. level of the new shaft.

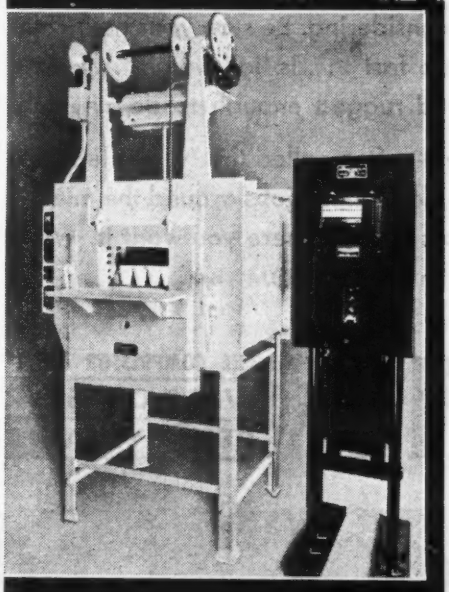
★An examination of the Three Kids mine and 1000-ton concentrator of the Manganese Ore Co., M. A. Hanna Co. subsidiary, with 300,000-ton stockpile of manganese ore in Clark county, has been concluded by a group of engineers for Metals Reserve Co. and Defense Plant Corp. who conferred with vice-president M. C. Lake, manager A. A. Hoffman and metallurgist H. L. Hazen. A statement by Mr. Lake said that the mining operation has exceeded expectations, both as to the quality of ore and tonnage delivered, but the plant "is not yet in full-scale production."

★Deepest cinnabar to have been developed in Nevada is being mined to a depth of 500 ft. in the new vertical shaft of the Cordero Mining Co. in northern Humboldt county. J. Ford McCormick is manager at McDermitt. A drill hole near the shaft continued in furnace-grade ore from 170 to 600 ft. and the shaft bottom at 500 ft. was reported in 30-lb. ore, with levels above breaking a 10- to 30-lb. product. Open-cut mining has been discontinued for the present and the 125-ton Nichols-Herreshoff furnace is operated on part time and altogether on development ore. The shaft, planned for 500 ft. depth, probably will be continued to the 600-ft. point or deeper.

★The U. S. Smelting, Refining & Mining Co. has awarded a contract for deep drilling on a lead-zinc property known as the Mountain View mine at Lone Mountain, 20 miles west of Eureka, acquired under lease and option from Vacarro, Frank and Cardinelli, veteran miners of Eureka county. Surface work and sampling were in progress with a crew of 17 men under direction of W. Frank Walthall of the U. S. company, with office at Eureka. U. S. company officers from New York and Salt Lake City lately inspected the property and visited the Richmond-Eureka mine at Ruby Hill, near Eureka, controlled by U. S. Smelting and on which the U. S. Bureau of Mines is drilling to depth from the 900-ft. level of the formerly productive Locan shaft. Near this point the Eureka Corporation Ltd. of Toronto is preparing to resume sinking its Fad claim shaft, now at around 600 ft., with William Sharp of Eureka manager.

★The Bradley Mining Co., through Worthen Bradley, president, has awarded contracts for deep churn drilling on its Opalite cinnabar mine just across the Nevada line in Oregon. The furnace plant has operated on part time in late weeks and the decision to seek ore at depth was said to have been prompted by results obtained in the Cordero mine, not far distant.





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UTAH

CIO strike affects copper production—Changes announced in Kalunite management

★Following a public hearing on June 26, the Utah State Tax Commission ruled that premium payments paid by the federal government to mining companies should be included in figuring gross proceeds for calculation of the occupation tax and net proceeds for determination of assessed valuation. As a result, the net proceeds valuation of Utah mines was fixed at $109,512,767, with the premium payments included. Without the premium payments, the net proceeds valuation would have been $97,804,348. The occupation tax was fixed at $967,205. Without premium payments included, this would have been $883,828. Last year the occupation tax was $792,313.

★More than 1,000 members of the International Union of Mine, Mill and Smelter Workers (CIO) at Garfield failed to report for work at the American Smelting & Refining Co. copper smelter and sulphuric acid plant July 1 because, union officers said, a contract had not been negotiated to replace the one which expired June 30. Disagreement hinged upon severance pay, sick leave, and guaranteed annual wage. The strike stopped smelting of concentrates from Utah Copper Co., world's largest producer of copper, and threatened production of 100-octane gasoline at plants in Utah and nearby states which require large quantities of sulphuric acid. Work was resumed July 3. Reid Robinson, Denver, MMSW president, said the strike was unauthorized.

★Some of the track labor problems at Utah Copper Co.'s huge open-pit copper mine at Bingham were solved when 200 Puerto Ricans were brought to do the work. Before they arrived, the company advertised for 200 additional workers. Now, although the Puerto Ricans are on the job doing good work, the company still needs almost as many more workers as it did before they arrived.

★American Smelting & Refining Co. has hired 50 women to do lighter work at its Garfield smelter.

★Reconstruction Finance Corp. has sued Aluminum, Inc., Marysvale, Utah, for recovery of $50,000 on a note. Aluminum, Inc., recently had its $1,000,000 contract canceled by the War Production Board.

★The annual report of National Tunnel & Mines Co., Bingham, controlled by Anaconda Copper Mining Co., shows that 181,087 tons of ore was produced in 1943, compared with 67,519 tons in 1942. Production of metals in 1943 (with 1942 figures in parentheses) follow: Copper, lb., 5,276,099 (2,052,750);

lead, lb., 1,566,963 (619,433); zinc, lb., 669,064 (210,512); silver, oz., 58,031 (29,970); gold, oz., 1,750 (779).

★Four changes in the operating management of Kalunite Corp., which has produced alumina on a limited scale at its Salt Lake plant from alunite mined near Marysvale, Utah, were announced July 6 by F. S. Elfred, Jr., of the executive staff of Olin Corp., East Alton, Ill. Mr. Elfred succeeds R. E. Phelan as general manager; S. J. Burris succeeds S. P. Lowe as general superintendent and in addition will be in charge of engineering and construction; and Dr. Arthur Fleischer becomes technical director. W. A. Williams, business manager, who has been on leave of absence since February, has returned to the Ford Motor Co., taking his old job as Salt Lake branch manager for that company.

★Utah underground non-ferrous metal mine operators were still negotiating July 18 with representatives of district Union No. 2, International Union of Mine, Mill & Smelter Workers (CIO), on provisions of a contract to replace that which expired June 30. Dan Edwards, international executive committee member for the union, said the operators and union officials are attempting to agree upon definitions of 19 points of controversy, which, it is expected, will be appealed to the national War Labor Board. Wage provisions—a decision upon which NLRB had not yet announced for the last contract—were not being considered in present negotiations.

IDAHO

New Hoist for Bunker Hill—Bradley seeks franchise for 1,000-hp. electric plant

★Polaris Mining Co., has declared its second 10 c. dividend for the year 1944, totaling $200,000. This makes a total of $400,000 paid this year and a grand total of $740,000. The company is incorporated for 2,000,000 shares, of which Hecla Mining Co. is the owner of 1,264,500 shares and Newmont Mining Co. 180,000 shares. The balance of 555,500 shares is outstanding. The Polaris company has heretofore confined its mining operations to what is known as the "Intervening Area," about 20 acres of ground on the Polaris vein lying between the Sunshine and Polaris groups. Polaris mined this area from the 1,700 level up and returned 40 percent of the profits to Sunshine; Sunshine mined the area from the 1,700 level down and returned Polaris 40 percent of the profits. In the past two years Polaris has remodeled its milling plant for the treatment of zinc-lead ore from the Osburn tailings deposit and is treating about 300 tons of this material daily. The company's main source of revenue, however, is

Cutting Slurry Handling Costs in Coal Washing

The operations of a midwestern coal company involve handling 600 to 1,000 gallons per minute of coal washery slurry which has a high pyrites and sulphur content. An analysis shows 100% minus 3 mesh, 85% minus 6 mesh and a specific gravity of approximately 1.5. About 45 tons of solids per hour are handled. The conditions involve a 36′ lift and discharging through 700′ of 6″ wood stave pipe.

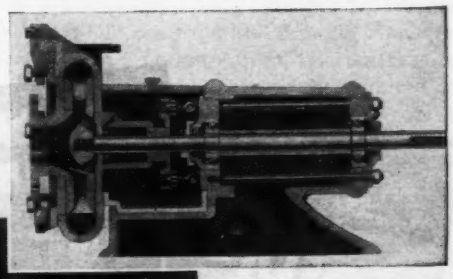
In August, 1942 the company wrote us:

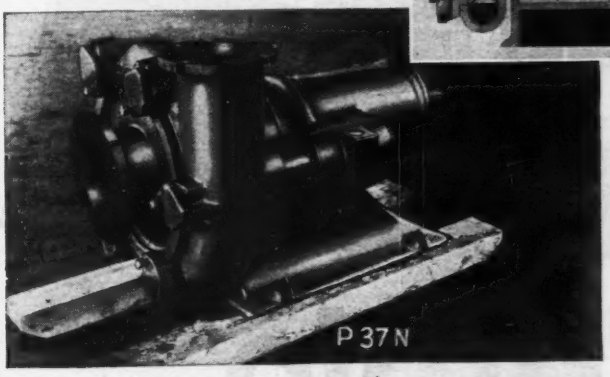
"We have been using for the past six or seven years a 4" rubber lined pump. The lining was entirely unsatisfactory due to the short life of the rubber and continual replacement. We then changed this pump over to a nickel steel alloy shell, and eliminated the rubber lining by the use of steel wearing plates. However, we were still wearing out a case about every six months and an impeller about every three months, which amounts to a high maintenance cost."

Subsequently an Amsco-Nagle 6″ Type "T," frame 19, manganese steel fitted pump like the unit pictured below was installed in this plant. We are now informed:

"The Amsco-Nagle pump was put into operation in January, 1943 and has operated 2½ shifts (20 hours per day) without trouble. The only replacements (after 11 months) have been a new suction plate and a new impeller. The previous pump operated only about half as many hours daily. The present pump has never been repacked. It was necessary to pack the former pump every few days."

Where abrasive or corrosive liquids are handled, Amsco-Nagle pumps are the economical solution. Ask for Bulletin 940.





Above: sectional view of Amsco-Nagle Type "T" Pump. At left: Type "T" Pump of the design used to handle coal washery slurry.

Send for Bulletin 941-W on Amsco Conservation Welding Rods.

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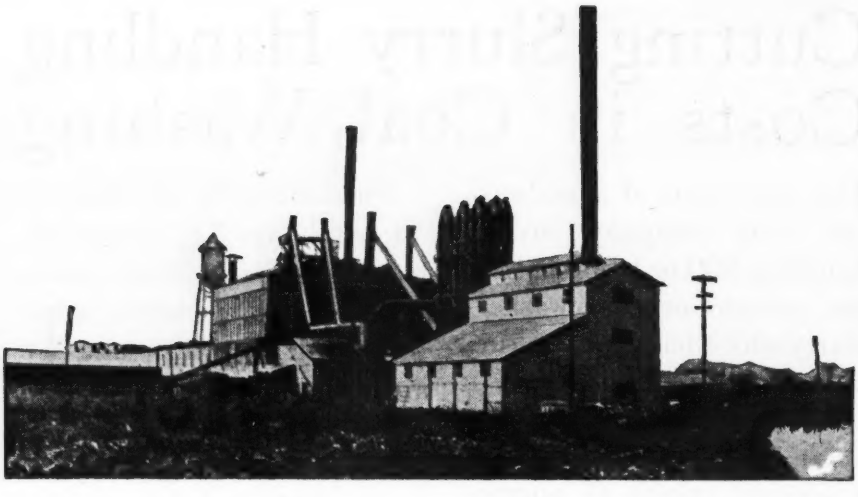

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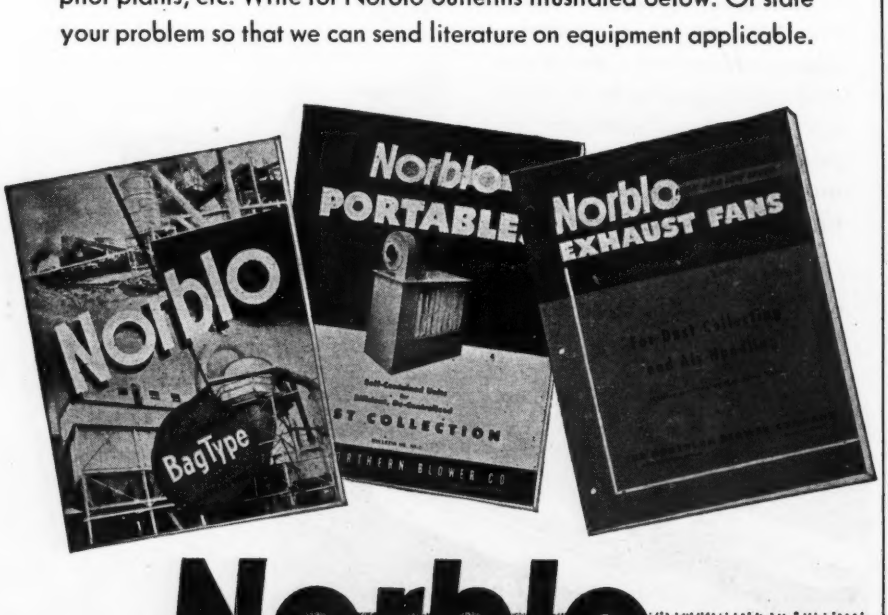

Norblo

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Idaho (*Continued*)

from the newly discovered Chester vein, about 300 ft. north of the Polaris vein and which has been opened through Sunshine workings on the 2,500, 2,700, and 3,100 levels. This development shows the largest and richest body of silver-lead ore that has been found in the Coeur d'Alene district in the past 30 years. In speaking of this development, L. E. Hanley, president and manager of Polaris, says in his 1943 report:

"Reference has been made in prior reports to development work that we were doing from the 2,700-ft. level of the Sunshine mine. The results from this work on the Polaris vein were disappointing, but the final step—a crosscut north to the Chester vein—cut a body of high-grade silver and lead ore. Subsequent development indicates that this is one of the most important ore discoveries in recent years in the Coeur d'Alene district.

"The ore discovered is in the Rambo claim of the Sunshine company and is approximately 4,000 ft. below the surface. By virtue of the so-called apex mining laws, the question of ownership of the ore arose immediately between Polaris, Silver Syndicate, Inc., and Sunshine. After extended negotiations a compromise agreement was entered into by the three companies. A dividing plane was established and two areas were created on the Chester vein. In the Rambo, west of the dividing plane, the equities in the ore are Sunshine 60 percent and Silver Syndicate, Inc., 40 percent. In the Omega area, east of the dividing plane, Sunshine and Polaris have equal rights. The Omega area extends approximately 2,200 ft. to the east of the dividing plane on the 2,700 level and contains a small area in which there is a conflict with third parties." (This refers to 400 ft. of the Chester vein in the Rotbart claim owned by the Lincoln Mining Co. and held under lease by the Silver Dollar Mining Co., and on which a working agreement has since been reached designating the 400-ft. section as the Rotbart area, the equities in which are Polaris, one-third; Sunshine, one-third; Silver Dollar, one-third, and Lincoln, 12½ percent of Silver Dollar's one-third before any deductions are made.)

"Any attempt to assert sole ownership," continues President Hanley, "would have resulted in years of litigation and the expenditure of hundreds of thousands of dollars, with the final result uncertain."

★Lucky Friday Silver-Lead Mining Co., operating a prospect at Mullan, has opened in its east drift workings on the 800 level, the richest shoot of ore so far developed. Assays by H. C. Adami, head assayer for the Federal company, show an average of 43.4 oz. silver, 39.6 percent lead, and 3.6 percent zinc across a face of ore 4 ft. wide. The 800-level development shows other shoots of ore containing high silver values but lower grade lead along a length of 250 ft. of vein so far prospected.

★The Callahan Zinc-Lead company, owners of the Interstate and Galena mines, in this district, is engaged in stripping new ground at its Livingood placer, near Fairbanks, Alaska, preparatory to the resumption of mining operations at the end of the "closed season" on gold mines.

★The Hull lease at the Federal company's Frisco mine, at Gem, has filed a report with the county assessor showing net profits of $111,532 for the year 1943. The Hull lease has been in operation during the past 12 years on the same vein now operated by the Federal company in the lower workings of the old Frisco mine. The leasing company is equipped with a modern flotation mill of 100 tons, daily capacity.

★The Coeur d'Alene Hardware & Foundry Co., of Wallace, has just completed and delivered to the Bunker Hill Mining & Concentrating Co. a large hoist which is being installed on the 2,100 level of the Bunker Hill mine as a preliminary step in a program of deeper development. The new unit is designated as a 400-hp. double-drum electric Coeur d'Alene mine hoist. With the exception of electric and other minor equipment, the hoist is the product of the local foundry. The rope pull of the hoist is 17,000 lb. at 800 ft. per min. from a depth of 2,000 ft. with a 4-ton load. The two steel drums are each 4 ft. in diameter by 4.6 ft. drum face and each drum is equipped with 2,100 ft. of 1⅛-in. steel cable. The machine is equipped with SKF spherical roller bearings and with Lilly Model "C" safety controllers, which prevent overspeed, overwinding and underwinding, and stop the hoist in case of power failure. It has dynamic breaking and is powered by General Electric motors. This installation by Bunker Hill is a part of the new deep development program mentioned by President Stanly Easton in his 1943 report, in which he said:

"The bottom level of the Bunker Hill mine, 2,800 ft. vertically below the Kellogg adit tunnel level and 400 ft. below sea level, is the practical working level of our present hoisting equipment, which has given excellent service for close to 20 years. Because of this a new hoist has been purchased and is in the process of installation. It should be in operation before the end of 1944. This new hoist will give, as a minimum, an additional working depth of 1,200 vertical feet. The estimated cost of this equipment and its installation for the years 1943 and 1944 is approximately $550,000, plus $11,359 for supplementary expense in connection with the hoist on the No. 2 service shaft. Additional outlays of approximately $250,000 will be necessary during 1945 for these two items. The war department has issued to us a certificate of necessity covering the above."

★Silver Dollar Mining Co. has driven a drift on its 1,800-ft. level for practically the entire length of the ground owned by the Silver Chieftain Mining Co., following what is considered by engineers to be the eastern extension of the rich Chester vein. The development has shown a strong vein fissure the entire distance and with considerable mineralization. Silver Dollar is now engaged in driving a crosscut several hundred feet to the south for Silver Chieftain, to prospect a block of favorable mineral territory.

★Sunset Minerals Co., which has recently constructed a 100-ton milling plant and new mine buildings at the Liberal King property, on Pine Creek, has lost by fire its compressor building, blacksmith shop, and dry house. The mill building was not damaged, and company officials say the loss will not interfere with mine production.

★J. V. Pohlman and R. H. Bailey, of Spokane, trustees of the West Hecla Mining Co., owner of three undeveloped patented mining claims adjoining the Hecla mine, at Burke, announce that they have negotiated an agreement for the sale of the property to a company to be formed to take over and develop the claims, offering stock-holders in the old company 600 shares in the new company for each 1,000 shares of the former company. Stock in the new company would be non-assessable.

★Federal Mining & Smelting Co., acting as agent for A.S.&R. in the development of the Highlands-Aurora mining property, in the Beaver district north of Wallace, has a crew of miners engaged in cutting an underground station for the installation of an electric-driven hoist and air compressor preparatory to sinking the main shaft to a depth of 1,000 ft. from the present 300 level. The development is a prospective venture on a well-mineralized shear fissure zone containing surface exposures of lead-silver ore.

★The Elk Leasing Co., of Elk City, is reported to have purchased the American Eagle property, on Seigel Creek, from Jacob Lorenz, for a consideration of $6,000. The leasing company has operated the mine and mill for a considerable time on a straight lease basis.

★The Coeur d'Alene Mines Corp. is making preparations to sink an additional 200 ft. from the 2,200 to the 2,400-ft. level. The productive oreshoot is 500 ft. long, with an average width of about 8 ft. Down to the 1,800 level this shoot averaged high-grade mill feed in silver, copper, and antimony, but from the 1,800 to the 2,000 level the ore lost most of its silver content. On the 2,000 level the silver content again shows improvement, and the company is going down another 200 ft. on the theory that the silver values will improve with additional depth, as has been the experience in other mines in the same belt. The company is equipped with a modern 600-ton flotation milling plant.

★Bradley Mining Co., in the Yellow Pine district, has made application to the State to construct a dam and pipe line to obtain power to operate a 1,000-

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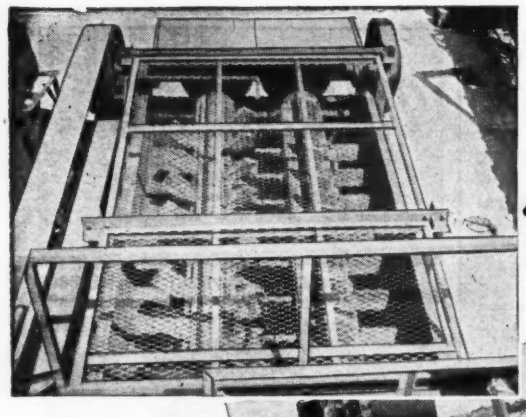

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Idaho (*Continued*)

hp. electric plant on Meadow Creek near the mine. Idaho Power Co. recently completed a 60,000-volt electric line into the district at a cost of $1,000,000. The Bradley company is operating an 800-ton-capacity flotation plant on tungsten, antimony, and gold ores.

COLORADO

Idarado takes over Treasury Tunnel from Metals Reserve—Leadville Tunnel In 1000 ft.

★Idarado Mining Co. has taken over the Treasury Tunnel property at Ouray and has assumed complete control after liquidating all advances made by Metals Reserve Co. C. W. Plumb, who has been with Metals Reserve for some time past, is now general manager for Idarado, and John Edgar is mine superintendent. Mr. Plumb expects to pursue the policy of Metals Reserve in developing the mine as rapidly as possible for the production of strategic metals, and hopes to begin the mining and milling of ore within a couple of months. Additions and alterations to the mill are now being made with that end in view. Mine developments, particularly on the lower levels, are said to have influenced Idarado in taking over the property at this time. Additional claims have been acquired, so that Idarado now has a large area of mineral land in one of the most promising regions of the San Juan. Treasury Tunnel was driven by Metals Reserve, with Sunshine Mining Co., of Idaho, as agent and Stiers Bros. as contractors, to tap the Black Bear orebody.

★R. W. Fraser, secretary of the London Extension Mining Co., reports monthly shipments of 200 tons of zinc-bearing ore to the Golden Cycle mill, at Colorado Springs. The property, known as the Orphan Boy mine, is being operated by R. H. Luckenbach, assistant general manager, and Junior Russell, general superintendent. This property is leased from the Kennebec Mining Co.

★Kokomo Kimberly Mines, Inc., operated under president J. Ben Ross, has been active in the development and production of zinc-lead ore in the Kokomo district. The group of claims taken over by the company in the summer of 1943 was reconditioned in the fall, and the crosscut tunnel was opened for 1,800 ft. Electric equipment and haulage were installed. Crude ore is being shipped to the Golden Cycle mill.

★George L. Gaskell, vice president of the Colorado Zinc Co., has leased properties at Crystal, and expects to be producing zinc for government use this summer. The company leased the Lead King, Black Queen, and

Lucky Boy, all Sheep Mountain claims. Opening the road to the property has been delayed on account of heavy rains.

★George H. Gillen, operating the Patti Rosa mine, under lease from the United Gold Mines Co., at Cripple Creek, is shipping a car of gold ore daily. G. L. Worthington, general superintendent, is carrying on a diamond-drilling program, as the shaft sinking that was started has been temporarily suspended.

★John M. and Albert L. Lyen have started work on their property near Mancos. The Thunder group of 18 claims owned by the late James Starr and associates, is held under a ten-year lease. The ore contains gold, silver, and lead. An 800-foot aërial tramway will be installed; likewise a new compressor.

★J. G. Clark, manager of the Clark Minerals, Inc., at Boulder, has purchased the properties belonging to Gold, Silver & Tungsten, Inc., located in Colorado and Arizona.

★The Jessen Brothers, Louis and William, have again returned to Aspen, and have reopened the Lucky Boy mine, in the Crystal River country. They operated this property last summer.

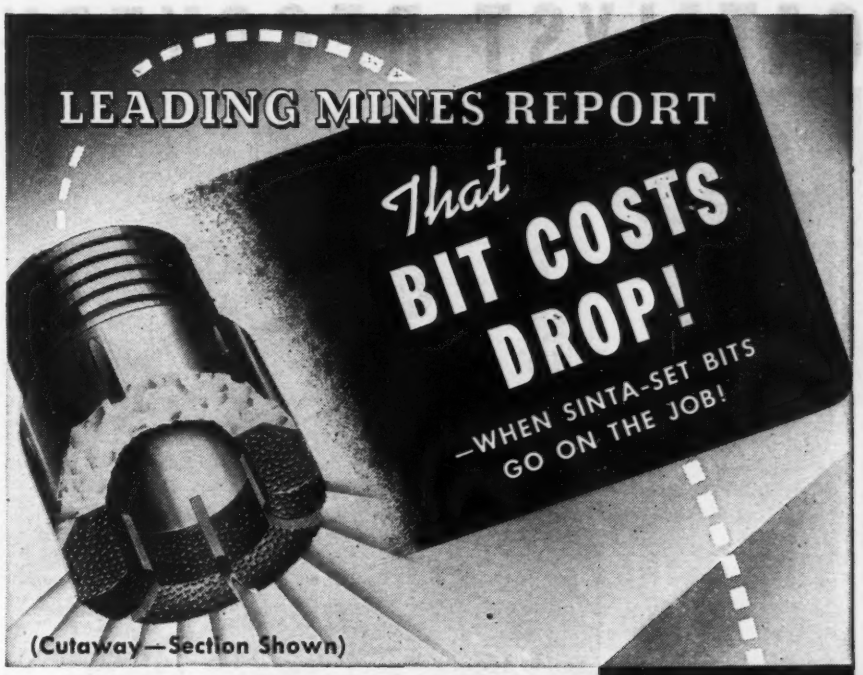
★Bert Easter and Gordon Milner have installed new equipment at the Silver Wing Gold Drill property, at Montezuma, which has been leased from John Burke.

★The Leadville drainage tunnel is now in more than 1,000 ft., and three shifts are employed in driving this bore. New machinery has been installed, and as the breast of the tunnel is in a hard formation, better progress can be made from now on. John Austin, of tunnel fame, is in charge of the work. The first ore is expected to be cut in about 2,600 ft. more.

★Shenandoah Dives Mining Co., at Silverton, under the direction of Charles A. Chase, has produced during the past 16 years over $8,000,000 in gold, $1,500,000 in copper, and nearly $700,000 in zinc. Yet the income for the first quarter of 1944 shows the best earnings. The income for this quarter was $120,512 before taxes, but after all charges. This compares with $26,864 for the same period in 1943 and $8,990 for the like period two years ago. With the discovery of a better body of ore and with the government premiums on zinc and copper, the company has been able to show a good return.

★E. E. Serry has been obliged to suspend operations at his feldspar quarry on Blue Mesa, near Gunnison, until a bridge is put across the Gunnison River at Sapinero. Until this is completed he will operate the property in Werner's Gulch, 6 miles up Quartz Creek from Parlan. Shipments will be consigned from Parlan to the Colorado Feldspar Co. at Canyon City, where the raw material is processed.

★A wage agreement between Manager Garvie of the Country Boy mine, at



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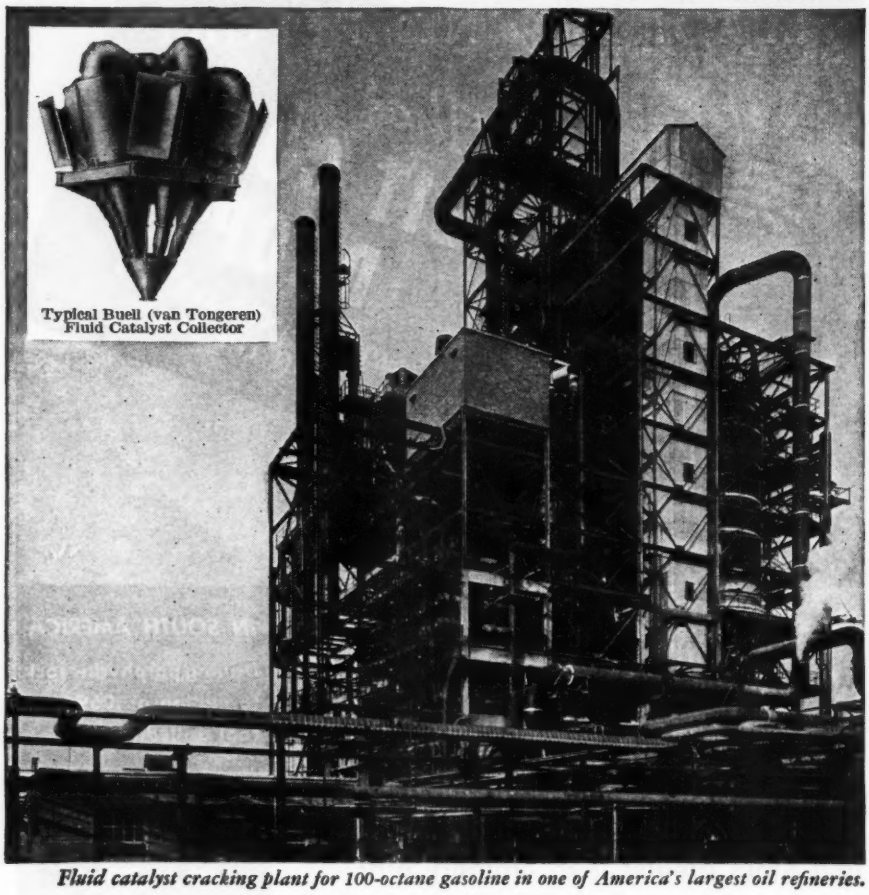

Fluid catalyst cracking plant for 100-octane gasoline in one of America's largest oil refineries.

Saving the Catalyst in High Octane Gasoline Production

• THE ABOVE ILLUSTRATION shows the plant of a large oil company, which is typical of the catalytic cracking plants used in the making of 100-octane gas. In this plant the fluid cracking process is employed.

An important part of the process is the Buell (van Tongeren) Catalyst Collector. Both the plant and the collector are representative of the type which have been installed by a number of oil companies, making possible the production of tremendous quantities of gasoline required by the war program. Catalytic cracking is but one of the developments which point up the ingenuity and scientific progress of the American oil industry and by which high production of 100-octane gas has been possible.

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Colorado (*Continued*)

Breckenridge, and the War Labor Board has been reached and the men have returned to work. The new wage scale also affects some 30 other mines in the territory.

★The Rico mining district, in southwestern Colorado, has been geologized and surveyed by the U S. Geological Survey, and a preliminary report on lead and zinc deposits has been prepared. Though the ores occur in both veins and in replacement deposits, the chief production has come from replacement deposits in limestone beds. Recently prospecting and development have centered around the Devonian limestone, as it shows signs of becoming a good ore horizon. This project is a part of the cooperative program for the investigation of the mineral resources of the State, and carried on by the USGS, the Colorado State Geological Survey, and the Colorado Metal Mining Fund. Copies of this Survey and report can be obtained upon application to the Director, Geological Survey, Washington 25, D.C.

★Robert McCracken, of Montezuma, is making regular shipments of zinc silver, lead ore to the Resurrection mill, at Leadville.

★Eugene T. Richards has leased the Meeker Success properties at Central City from the Stroehle estate, and has completed more than 100 ft. of drifting on the 500-ft. level. He is carrying on diamond and core drilling on the 400-ft. level and expects to have the mine producing ore soon.

★O. G. Carstens has been appointed superintendent of the Highland Mary Mines Inc., near Silverton, and is getting the property ready for seasonal operation.

NEW MEXICO

Shortage of labor is handicapping operation of mines and mills

★Marston and Berl, of Colorado Springs, have joined W. J. Knighton in a lease of the Little Goat operation in the Central mining district. Under the new arrangement Edgar Thornton is the engineer for this operation, as well as for the operations at Duncan, and D. W. Rhinehardt is superintendent of mining for both places. The work on the Little Goat consists of exploratory development and preparations for sinking a new shaft. This is a lead-zinc mine with good gold values. The operation at Duncan is in the old Mohawk Mine, across the line in Grant County, up Bitter Creek from Duncan. Values there are in fluorspar. The small amount of development work done so far gives indication of a valuable deposit. For the time being at least,

Mr. Marston has discontinued work on the Apache mine, at Hachita, and has moved the equipment to the Mohawk.

★D. W. Schmitt, general manager of the New Mexico Ore Processing Co., announces his company has leased part of the old Savannah mine properties at Pinos Altos, consisting of 18 claims. The company contemplates early operation of the mines, from which lead and zinc ores are taken that run fairly high in silver and gold.

★C. H. MacIntosh has installed a 300 cu. ft. electrically driven air compressor on a lease of the Atwood Group, 2½ miles south of Lordsburg. The mine is producing about two cars weekly of copper ore containing gold, silver, and lead. Indications are that this mine may with additional development soon become one of Lordsburg's large producing mines.

★The Newalpitt Corp. has one of the largest fluorspar deposits in the State, but labor shortage has kept the company from developing this property for several months. What is true of the Newalpitt property is likewise true in the Central and other mining districts of the State. A census of the milling operations discloses the fact that several metallic and non-metallic mills were compelled to shut down because their mines are working shorthanded and not producing ore in quantity sufficient to make it possible to operate the mills full time.

★Rufus C. Little, of Deming, is stepping up production and shipment of high-grade manganese from his Florida Mountain mine.

ARKANSAS

New sintering plant under construction—Big Hurricane mill nearly completed

★Production in the north Arkansas zinc and lead field is still at a low ebb. Little ore was produced in June.

★S. & G., Inc., J. C. Shepherd, of Harrison, in charge, will have its new plant at the Big Hurricane mine in operation before Aug. 1. The company expected to start late in June or early in July, but many difficulties have delayed the work. The plant will handle approximately 300 tons of crude a day. Plenty of crude is ready for milling. Production will be zinc carbonate concentrates.

★Hall Mountain Mining Co., in charge of J. C. Jones, Yellville, has stopped operations. The company could not find a market for two carloads of zinc carbonate ore which it mined in its exploratory work, and will not start routine operations until it has found a market. It has opened ore faces and bought mill equipment, and will build a mill when sure of a market.

(*Continued on next page*)

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Arkansas (*Continued*)

★Advance Mining & Engineering Corp., operating the North Star, near Harrison, John Stone, of Harrison, in charge, is still making test runs on its dry milling plant which was completed in June.

★Ore production in June, in the Batesville-Cushman field, ran to approximately 1,676 tons, of which 694 tons was high grade, and 982 tons low grade. There has been but little rain in the field during the last five weeks and mining conditions are good. Operators, however, are finding it difficult to get enough labor.

★The E. and A. Manganese Co., which has been down for the last two months, now has its plant in operation on the bayou in Batesville. James Wood, former operating engineer, has quit. Max Cohen is in charge of operations, and George Weigart is operating engineer. Their office is at the plant in Batesville. They have abandoned their jigs and are now leaching and washing low-grade ore from their properties, which raises the grade from low to second. They expect to install a more modern plant as conditions improve.

★Robert Allen, of Carson City, Nev., has been assigned as assistant to Major Ruggles, at the Metals Reserve buying depot at Batesville. Metals Reserve purchases nearly all of the manganese ore that runs above 35 percent Mn produced in the field. Five hundred tons of low grade was shipped from its big stockpile at Cushman, to the Woodward Iron Co., Woodward, Ala., in June, and 250 tons will be shipped in July.

★C. S. Little, of Batesville, operating the Grey Hill property, near Batesville, now has two shafts in production and another shaft going down. C. E. Holmes, an associate of Mr. Little, has a beneficiating plant under construction at Pfeiffer, which he expects to have in operation about Aug. 1. Equipment will consist of a deslimer and sintering furnace. The latter will be fired with butane. Preliminary tests of the method show that it will reduce two tons of low-grade wad ore in the 20 percent bracket to one ton of high-grade in the 40 percent bracket.

TRI-STATE

Big Tom company developing promising ore—Northside Mining property leased

★Due to the general shutdown for the Fourth of July, the weekly production rate for the first week of July dropped to its lowest level since the flood of May, 1943. With the resumption of operations following the holiday, the zinc concentrate output rate has thus far failed to climb back above the

7,000-ton weekly mark. The steady decline in output is attributed largely to the scarcity of efficient labor, which is getting tighter all the time. Production for the first half of the year averaged slightly above 7,500 tons weekly. For the first week of July it dropped approximately 2,200 tons below this average.

★Southwest Mining Co. has reopened and deepened an old shaft on the Dr. Myers land near Stark City, according to Ray Smith, who is interested in the company. The shaft is that of the old K. & D. Mining Co., which was sunk in the early nineties. It has been enlarged from its original dimensions of 4.5 ft. in the clear to 6 ft. The old mine shaft was 60 ft. deep with a winze extending down an additional 25 ft., Mr. Smith said. The company has deepened the main shaft to the 90-foot level, where a lead deposit is to be developed. A derrick has been built over the shaft and a gasoline motor hoist has been installed. The shaft is located about 300 feet southwest of the company's new mill, which was completed and placed in operation last year. At the mill shaft the company is mining a high-grade silicate ore deposit around the 200-foot level.

★M. & W. Mining Co. has moved a large derrick and hopper from the old Brewster No. 1 mill shaft on the former Federal lease, a mile and a half east of Picher, to its new No. 7 shaft on the Huttig lease, a half-mile to the northeast. The new shaft was completed only a few months ago, and the mine is now ready for exploitation. Ore will be trucked to the Beck No. 1 mill, a mile to the southwest, for treatment.

★Big Tom Mining Co. is sinking a new shaft on the 20-acre Trussell lease in the Thoms Station mining area northwest of Joplin. The shaft is being sunk in the immediate vicinity of several drill holes put down recently. At least seven of the holes disclosed good zinc ore, the cuttings of which ran from 7 to as high as 20 percent in recovery values, with some lead at certain levels ranging from 5 to 10 percent, it was reported. The ore runs extended from a depth of 125 ft. down below the 200-foot level. The company constructed a derrick for the installation of mining equipment. Among those associated in the company are Congressman Thomas D. Winter of Girard, Kan., L. C. Aggus of Joplin, W. M. Frogue of Columbus, and W. C. Taylor of Baxter Springs, who did the drilling.

★Northside Mining Corp. has leased its St. Louis-Joplin mining tract comprising 160 acres of land in the Chitwood area, northwest of Joplin, to W. S. Rice and associates, according to George W. Moore of Joplin, president of the corporation. The lessees have agreed to dewater, develop and mine the old Ethel Gray mill shaft and the old ABC shafts to the north and east of the Northside mill on the lease, and will continue to conduct milling operations at the mill, Moore said. Two eight-inch turbine pumps,

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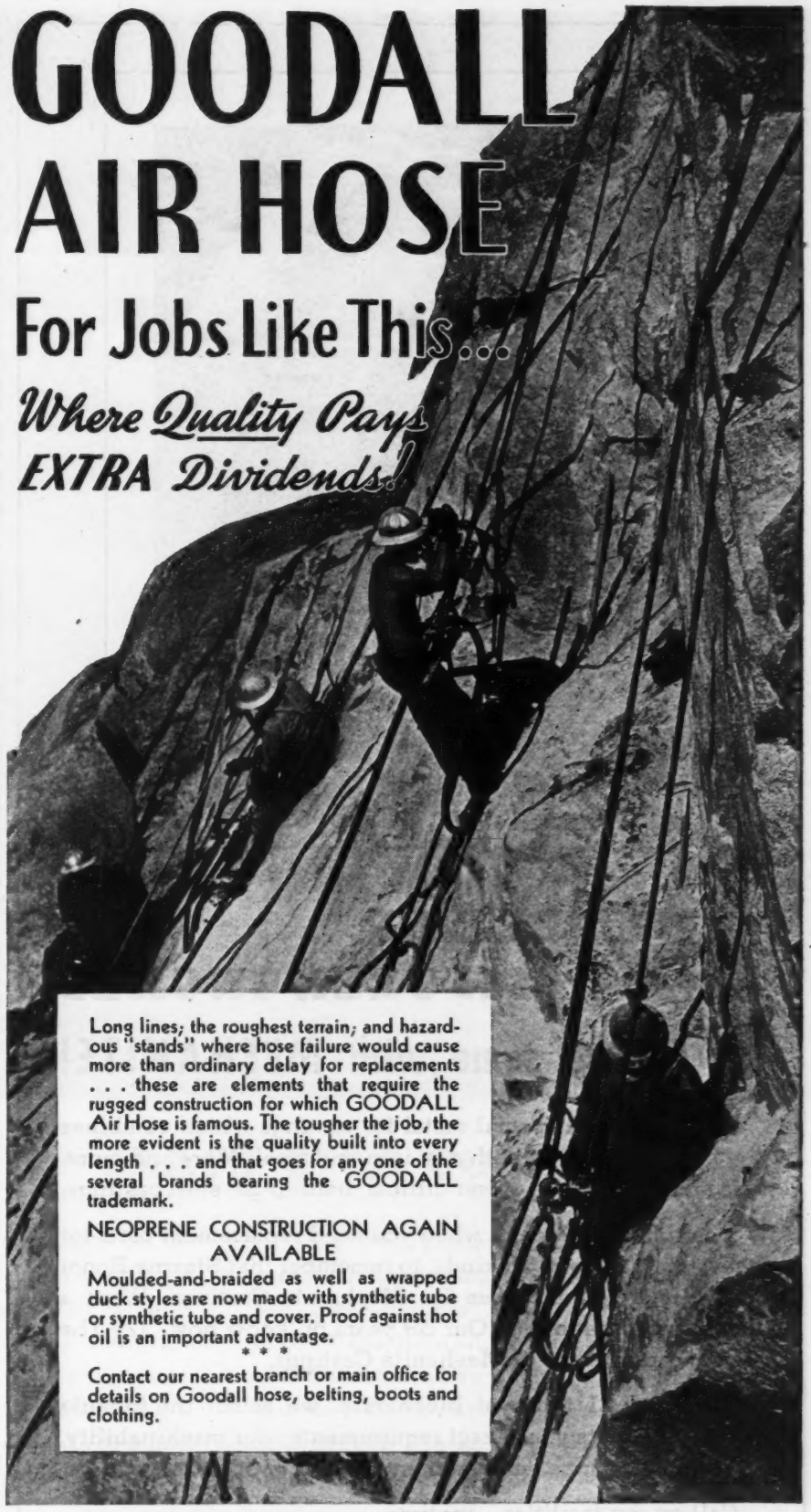

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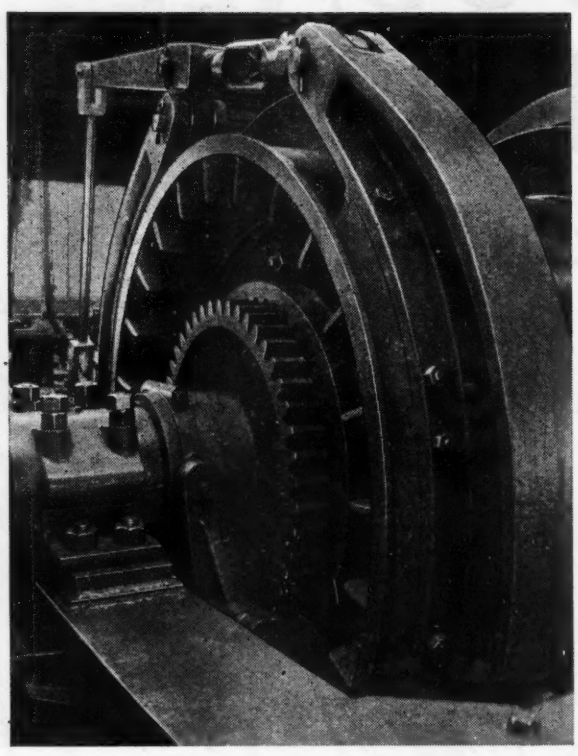

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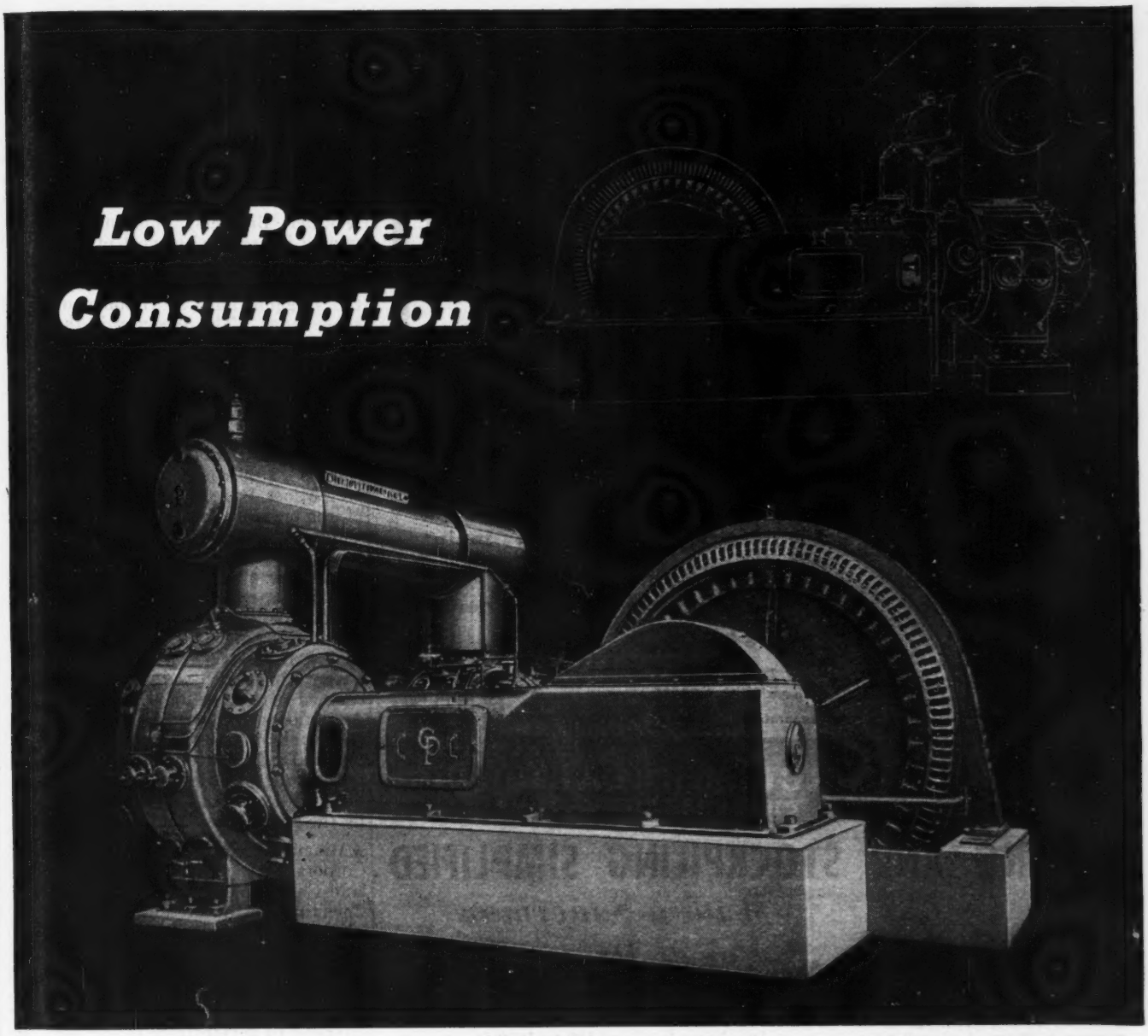
Tri-State *(continued)*

powered by electricity, have been installed and placed in operation at the two shafts—a Fairbanks-Morse at the ABC and a Peerless in the Ethel Gray shaft. The ground will be dewatered to the 180 and 200-foot levels, where mining operations will be carried on. Rice is general manager in charge of operations, with Jasper Newton Doty as ground foreman and Ernest G. Kennedy is supervising milling operations. Operations will continue to be carried on under the name of the Northside Mining Co., Mr. Moore said.

★Eagle-Picher Mining & Smelting Co. has closed, effective July 1, its separate ore-buying office in Joplin, which the company had maintained for the convenience of small lead ore producers over a period of many years. The work of the office—that of making settlements on small, or odd, lots of lead ore—has been transferred to the ore-loading and ore-purchasing department in the company's general district office, which is under the direction of John W. Grounds of Joplin. These purchases of ore, which originate principally from the Galena, Kan., and Joplin sections of the Tri-State district, will be delivered directly to the company's Galena smelter, eliminating the extra handling of the past, Mr. Grounds said. The other office had been in charge of the late Fred Braun over a period of 30 years until his death June 17.

★Dines Mining Co. has completed the moving and installation of a 400-ton hopper at its No. 3 mine on the Hartley land, a half-mile west of Baxter Springs. The company first raised the derrick, built of material obtained in the dismantling of the derrick at the No. 1 shaft, and then moved the storage unit from the No. 1 mine to the new development about a month ago. The company is conducting mine operations around the 230-foot level and has deepened the shaft to the sheet ground around the 260-foot level, where operations will be extended as soon as the lower ground is dewatered. Ore from the Hartley development is being trucked to the company's Blue Mound mill north of Picher in Kansas. H. G. Weidman of Baxter Springs is in charge of the operations.

★Cameron & Henderson, Inc., is reopening the east, or No. 3, shaft on the old Admiralty lease, southeast of Cardin, according to S. E. Henderson of Baxter Springs, secretary-treasurer of the company. A new derrick and hopper over the shaft will be used to pull ore from three levels of the mine—the 90, 125 and 160-foot, Mr. Henderson said. Ore will be trucked to the company's Romo custom mill near Lincolnville for treatment. Mr. Henderson also reported that the company had sub-leased its Valliere mine and had cut out the Nevins mine, both in the Lincolnville mining area. The Craig Mining Co. continues mine operations in the area and treats its ore at the Romo custom mill.



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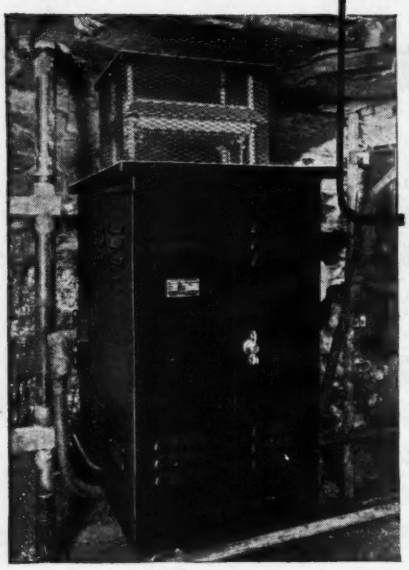

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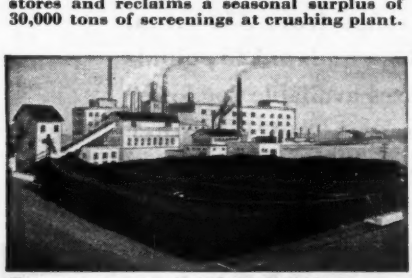

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IRON COUNTRY

Canisteo to treat fine waste—C.-C.I. soft ore mines reduce hours—Steep Rock output sold

★Butler Brothers, independent iron mining interest, with most of its operations centered about Cooley, Minn., on the Mesabi, is also producing from the Weggum mine at Hibbing, on the same range. The Weggum is the former Philbin mine, a State lease, converted from a shaft mine to an open pit by Butler Brothers. It has a treatment plant designed for washing ore and for drying also.

★Cleveland-Cliffs Iron Co. has contracted to purchase from Steep Rock Iron Mines, Ltd., the entire 1944 output of iron ore from the latter's new mine in Ontario. The same contract provides for purchase of substantial tonnages of this ore for a period of years. Production is expected to start around the middle of the current month. The dewatering of Steep Rock lake at Atikokan, Ontario, continued. To July 1 the amount of water pumped had reached a total of 65,000,000,000 gal. A suction dredge has been floated on the remaining water to pump dredgeable material at the bottom of the lake, which is the start of stripping of overburden atop the deposit of iron ore to be mined by the Steep Rock Iron Mines, Ltd.

★Minerals Separation North American Corporation is now installing at Cleveland-Cliffs iron ore washing plant at Coleraine, on the Mesabi, a pilot plant to treat fine washer-plant waste iron material by a froth flotation process. The new plant will take cuts of material running about 21 percent in iron from a pile line for treatment. The plant is intended to demonstrate to the Mesabi operators the possibilities of the new process. The pilot plant is the result of two years of laboratory experimentation by Minerals Separation engineers.

★Officials and directors of Cleveland-Cliffs have just completed their annual trip of inspection to the company's iron mines in Minnesota and Michigan. The directors present were W. G. Mather, chairman of the board, E. B. Greene, president and director, F. E. Williamson, director and president of New York Central Railroad, M. B. Brainerd, director, and president of Aetna Insurance Co., and George Gund, member of Cleveland-Cliffs executive committee, also president of Cleveland Trust Co.

★The Duluth Missabe & Iron Range R. R. made a new 24-hour loading record, June 15, when its Duluth and Two Harbors ore docks loaded 406,484 gross tons of iron ore. The previous record was made in 1942 when 337,180 gross tons was loaded in 24 hours.

★Starting July 1, all Saturday work was suspended at the soft-ore mines of Cleveland-Cliffs Iron Co., at Negaunee

and Iron River, Mich. This is due to reduced operations in the steel mills caused by man-power shortage. The Cliffs Shaft and Mather mines continue on a six-day schedule.

★Field parties of the Geological Survey are working in Iron County, Mich., seeking new areas to explore for iron ore and in the Copper Country, where they are making a survey of new mineral possibilities.

★The Centennial celebration and pageant commemorating the discovery of iron ore on the Marquette Range reached its climax July 4 with an interesting parade at Negaunee, Mich., and a pageant of pioneer scenes at night.

★"Ventilation of the Newport Mine," by H. L. Schieber, superintendent for Pickands, Mather & Co., was among the papers presented at the Lake Superior Mining Section of the National Safety Council in Duluth, Minn., June 22 and 23. This mine is on the Gogebic Range near Ironwood and has two shafts ¾ mile apart: the old Woodbury, 2,535 ft. deep and the newer Newport shaft, more than 3,100 ft. deep. There is an orebody at each end about 90 ft. wide, and these are connected through various underground drifts or levels. With proper arrangement of crosscuts, sublevels, cross raises, and 16-in. Ventube, it is possible to supply 100 miners in the area with ample fresh air by using a main ventilating unit at the collar of the Woodbury shaft having a capacity of 60,000 cfm, and driven with a 60-hp. motor. During the winter the air is automatically heated to maintain an average temperature of plus 40 deg. F. On an average yearly production of 550,000 tons of ore, maintenance of this ventilation system averages 3½ c. per ton of ore produced.

★A new committee was recently appointed by the State Treasurer, D. Hale Brake, to study Michigan's plan of taxing mineral values. The members are E. Blythe Stasen, dean of the law school of the University of Michigan; George E. Bean, city manager of Escanaba; and George P. McCallum, tax expert of Ann Arbor. Of all the committees appointed in the past to study the Finlay method of valuing mineral properties, which has been in force for close to 30 years in Michigan, not one has come forward with a plan to improve that now in operation.

★Recently, while returning from Duluth to Washington, D. C., the War Labor Board panel visited the Marquette Range after completing hearings in Duluth on arguments opposed to wage increases for miners in the Lake Superior district. The C.I.O. will present its side of the case in Washington. The party included Davis Cole, chairman, and N. P. Finsinger, vice chairman, acting for the public; John Despol, of San Francisco, and Stephen Livitsky, of Pittsburgh, representing the C.I.O.; and Thomas M. McCabe, of Duluth, and R. C. Allen, of Cleveland, representing the mine operators.

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MICHIGAN

C. & H. may acquire Keweenaw Copper's assets—Iroquois shaft reaches 19th level.

★Shareholders of the Keweenaw Copper Co., at a special meeting in Duluth, Minn., July 24, authorized the directors in their discretion to accept or reject an offer by Calumet & Hecla Consolidated Copper Co. to purchase 34,544 acres of land and other property, exclusive of cash and securities. The meeting was adjourned to re-convene Aug. 21 in Duluth. Certain aspects of the transaction will require further consideration by the Keweenaw directors.

The assets involved consist of the land, which is in Keweenaw County, all the capital stock of the Keweenaw Railroad Co., and a small amount of personal property. The lands are valuable chiefly for their mineral possibilities and the timber on them. Because of the unfavorable location and inferior quality of the timber, Keweenaw has not been able to dispose of any substantial quantity. So far as mineral possibilities are concerned, the Keweenaw directors believe they exist and warrant exploration. However, such exploration will be expensive and no company or group other than Calumet & Hecla has any interest in the area. Keweenaw Copper has long tried to sell or lease its land to Calumet & Hecla, and regards the offer received as most favorable. Calumet & Hecla already owns a substantial acreage near those it will take over from Keweenaw.

Keweenaw Central Railroad originally owned 38.73 miles of track, but most of the rails have been taken up. A small part of the road has been under lease to Calumet & Hecla, and Keweenaw has been receiving $1,200 rental per year.

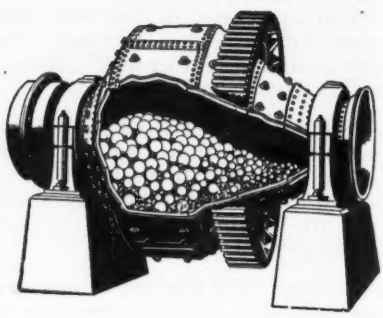
★Shaft sinking in Calumet & Hecla's new Iroquois mine has reached the 19th level, where a plat will be built preparatory to drifting north and south. Better mineralization is being met at depth, which checks with diamond-drill investigations.

CANADA

Berens River Mines installs zinc flotation plant—Normetal raises its milling rate

QUEBEC

★Early in June, O'Brien Gold reported the discovery of high-grade ore recalling the spectacular sections developed several years ago. Drifting on the No. 4 vein at the 2,625-ft. horizon, a round was broken that disclosed lenses of free



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gold. Muck samples, after sorting out the coarse gold, assayed 1.355 oz. and it is reported that 150 oz. was recovered from the round. On the level above, a high-grade intersection was reported at a point about 300 ft. east of this new showing. On the level below at 2,750 ft., more extensive drifting shows ore well below the mine average of $14.38 a ton. Stations have been established on both the 2,875 and 3,000 levels but no drifting has been started there on the No. 4 vein. J. A. O'Brien is president and Harry E. Sparks mine manager.

★McWatters Gold Mines, in Rouyn Township 6½ miles east of Rouyn, started production in September 1934 and shut down the mill in June 1944 after exhaustion of ore reserves. McWatters, in partnership with Siscoe Gold Mines, is now active in exploring the Cook and Alewco properties, incorporated as Mudlac Gold Mines. This ground is near the Belleterre mine, in the Mud Lake section. Although no orebody has been cut in first 7,000 ft. of diamond drilling, a $60,000-program provides for extensive testing

★Under contract to Dec. 31, 1944, for marketing output, Normetal Mining Corporation has stepped up the daily mill rate to 600 tons from last year's average of 563. Monthly output has recently been at the rate of 1,750,000 lb. zinc and 1,250,000 lb. copper. At the end of 1943, ore reserves were reported to be 1,437,700 tons grading 6.94 percent zinc, 3.67 percent copper, 0.029 oz. gold per ton and 2.31 oz. silver per ton. Stoping has not been attempted below the 2,150-ft. level although preliminary development has been carried down to the 2,500 horizon. Labor shortage has prevented new development. An effort is being made to secure additional power. J. H. C. Waite is president and Hon. Charles McCrea vice-president.

★Mylamaque Gold Mines has completed drilling a series of shallow holes in the central part of the property, located south of Lamaque Mines, and two diamond drills are being employed for deep tests at both ends of the section tested. Depths below 1,000 ft. are to be explored along the north and south contacts of a diorite dike. Extensions of this dike have indicated gold deposition in drill holes on adjoining properties. A. W. White, Jr., is president.

★John C. Rogers, consulting geologist for Peribec Gold Mines, Pershing township, has laid out a program of surface work and diamond drilling to test a shear zone that has disclosed promising gold values. Gold discoveries have followed recent work in this area by Consolidated Smelters, Perron Gold Mines and Croinor Mines.

★Duquesne Mining Company has optioned 14 claims at the west end of its property in Duparquet and Destor townships, to Steeloy Mining Corporation and results have been reported from the first three holes of an extensive drilling program. All three holes intersected mineralized porphyry over widths

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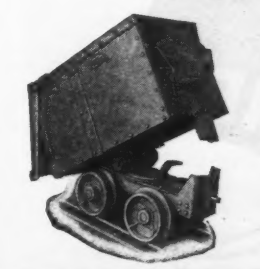

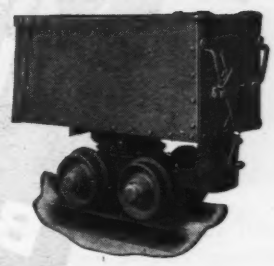

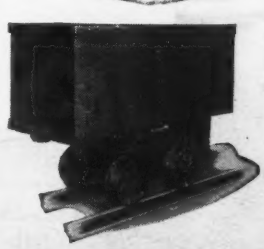

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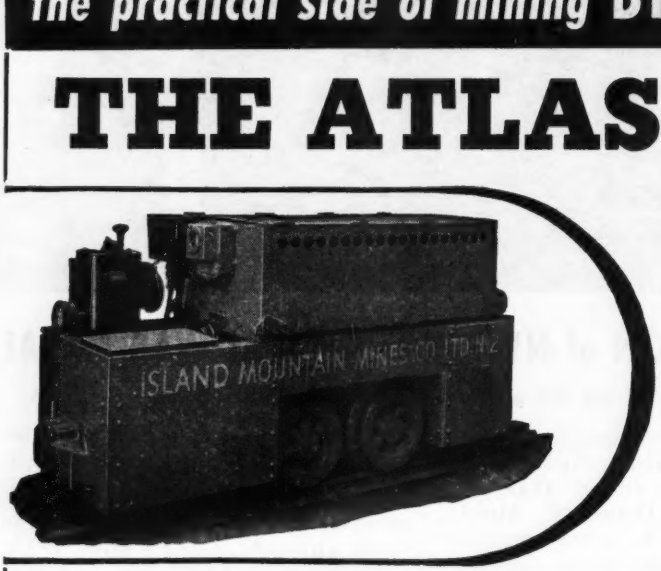

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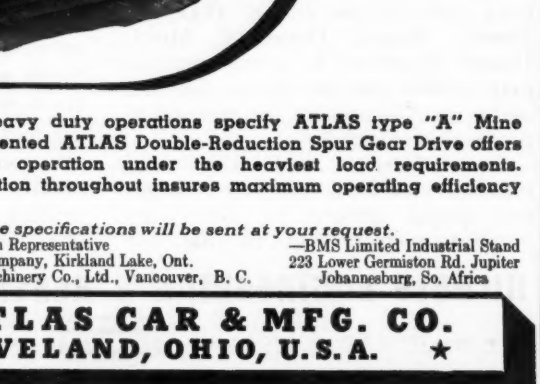

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Canada (*Continued*)

of from 48 to 100 ft. A 9.5-ft. section disclosed values ranging from $2.69 to $15.01 per ton. C. Glenn Hunter, president, reports that important ore has been indicated in the shaft located near the east end of the Duquesne property, five miles from the present drilling.

ONTARIO

★Berens River Mines, controlled by Newmont Mining Corporation, started its 225-ton cyanide and flotation mill in September 1939 and last year contracted with Metals Reserve Company for production and sale of zinc concentrates. A zinc flotation plant has been installed at the property, which is farther north than any other mine in the Province and is connected with Lake Winnipeg, Manitoba, by a 180-mile winter road. H. DeWitt Smith is president and E. J. Martin is manager. Record output was secured in 1942, recovery averaging $18.39 a ton, but there has been a reduction in grade from the 250 ft. level down to 1,400 ft. Values have shown improvement on the 1,550 and 1,700 levels and the main zone is to be opened up on the 1,850 level before the end of August. In the meantime, a winze was started about July 15 from the 1,700-ft. level to open new horizons from 2,000 down to 2,300 ft.

★A new zone is reported on the 1,400-ft. level of Bidgood Kirkland Gold Mines. A 5-ft. core length from a hole put out from the east drift at this horizon assayed $22 per ton. Production in May 1944 amounted to $29,731 compared with $48,846 in the same month a year ago. In the first 5 months of 1943 production totalled $245,766, averaging $11.84 per ton. Frank L. Smith is mine manager.

★Shaft sinking is reported to be under way at the fluorspar property of Detomac Mines, Huntingdon township, near Madoc. Under former owners, three shallow shafts reached a maximum depth of 40 ft. and the present program provides for extending one of these to 100 ft. and resuming ore shipments. F. S. Tobin is president and C. C. Fischer mine manager.

★The Ontario Department of Mines reports substantial improvement in the safety record of the industry in 1943. Mining accidents decreased 3.6 percent and fatalities 28 percent, as compared with the previous year, representing 29,477 persons employed at mines, metallurgical works, quarries, and clay, sand and gravel pits.

BRITISH COLUMBIA

★Mine operators in British Columbia are disappointed that greater consideration has not been given to mining in the Dominion budget, introduced before the House of Commons early this month. A brief presented by the Mining Association of B. C. in an appeal to Ottawa authorities stated in part: "The taxation of mines on the same basis as

commercial enterprises fails to take into account the speculative hazard of mining. Great risks must be taken by capital, which accordingly can only be attracted by the inducement of proportionately high returns. . . . Apart from the speculative hazard, due regard must be taken of the fact that a mine is a wasting asset. Mining is, in effect, a salvage operation, and unless successful operators are encouraged to spend their profits on the acquisition and development of new mines, the industry will perish. Every increase in taxation necessarily increases the cost of production, and thus hastens rapid depletion, since the effect is to eliminate progressively the mining of the lower grades of ore in mines, thereby not only reducing their productive and tax-paying span, but as such ore once left in the ground is subsequently irrecoverable, a serious and unnecessary loss of a national asset is occasioned."

The provision in the Budget authorizing the setting up of reserves for maintenance and repairs, which in the case of mining would include underground development, is a recognition by the Minister of Finance of the persistent pleas of the mining industry of this Province. In this connection, *Engineering and Mining Journal* has been advised by H. Mortimer-Lamb, secretary of the Mining Association of B. C.: "It is true that the reserve authorized is limited and not actually adequate, since it is to be based on one-half of the expenditures on this account incurred during a period to be determined by government, but it is at least a step in the right direction. In particular the mining industry in the past two years has been severely and unfairly penalized in that because of the shortage of manpower it was inhibited from carrying on development operations in balance with production. As development expense is necessarily a recognized chargeable cost against production, it followed that the imposition of income tax based on production excluding this cost was unjust and discriminatory."

★One of the first experiments to be conducted by the recently created British Columbia Industrial and Scientific Research Council will be to test charcoals made from local soft woods in an effort to determine their value in the reduction of iron ores. This method of recovering iron from the extensive Zeballos deposits has been proposed by Privateer Mine, Ltd.

★The period during which grubstakes were issued in this Province under the "Prospectors' Grubstake Act" expired on June 30th.

★A sharp revival of interest is noticeable among public bodies as a result of the projected plans of Privateer Mine, Ltd., to establish an iron-and-steel industry at Zeballos, on the west coast of Vancouver Island. Acting on recommendations by its Mining and Engineering Bureau, the Vancouver Board of Trade has forwarded the following resolution to Provincial authorities: "Vancouver Board of Trade,

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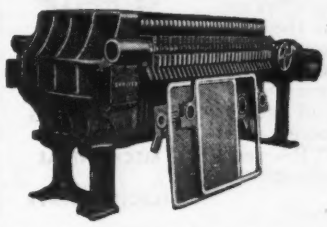

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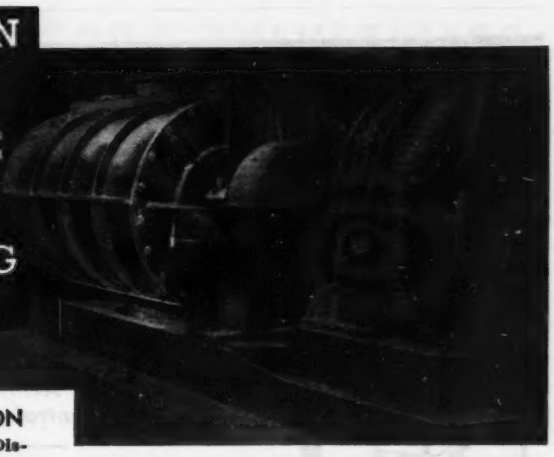

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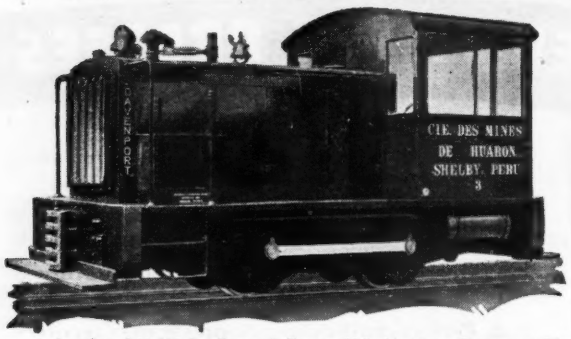

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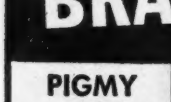
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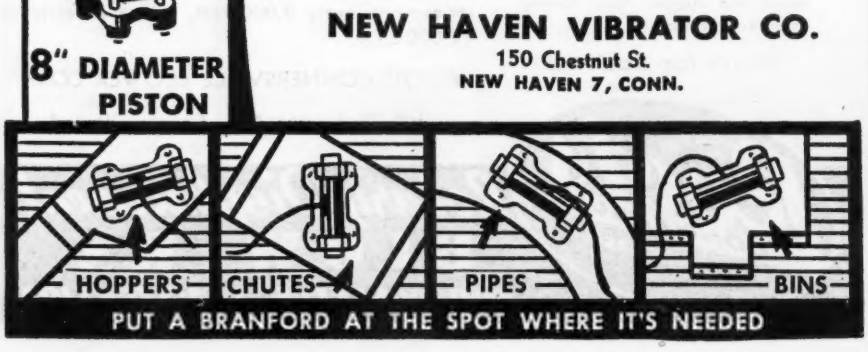


PUT A BRANFORD AT THE SPOT WHERE IT'S NEEDED

Canada *(continued)*

feeling that new industrial development will be most advantageous to British Columbia, is highly interested in proposals for establishment of an iron-and-steel industry by private enterprise. It urges the government to investigate the economic feasibility of the project and lend such assistance as is merited."

The Vancouver City Council's semi-public Civic Steel Committee has gone on record as vigorously opposing the export or British Columbia iron ores for treatment elsewhere.

★Net smelter returns of Silbak Premier Mines, Ltd., Portland Canal district subsidiary of Premier Gold Mining Co., Ltd., from June production were $54,316. Recovery was made from the treatment of 5,673 tons, averaging 0.25 oz. gold and 2.07 oz. silver per ton. Estimated operating profit before provision for depletion and depreciation was $5,047. The International Union of Mine, Mill and Smelter Workers (CIO) has commenced negotiations with the management with a view to obtaining a labor agreement.

★Recent development work at the Texada Island properties of Industrial Metals Mining Co., Ltd., has had unusually encouraging results. A diamond-drill hole, 400 ft. south of the Little Billie shaft, driven to ascertain the geological structure preparatory to connecting the Little Billie and Copper Queen mines by crosscut, has intersected a major orebody averaging approximately $15 per ton in gold, copper, and silver. This new discovery has, in the opinion of Dr. Victor Dolmage, consulting geologist, doubled the estimate of ore reserves. Consequently it is now planned to erect a 100-ton mill near the Little Billie shaft. Meanwhile the Copper Queen shaft is being dewatered and rehabilitated. During the early days of this century the Texada Island properties, now owned by Industrial Metals, were the source of gold-copper ore shipments exceeding eight million dollars in value.

★During the second quarter of 1944, Bralorne Mines, Ltd., Lillooet mining division, produced 19,044 oz. gold, valued at $733,194, from 26,549 tons, averaging 0.717 oz. gold per ton. The grade is the highest ever recorded over such a period by the company. Production for the first half of 1944 is now 35,326 oz. gold, valued at $1,360,051, from 52,862 tons, averaging 0.67 oz. gold per ton. Shareholders have been advised as follows: "The labor shortage has become increasingly acute during the past quarter. Excellent development results in the '77' vein on the 18 and 19 levels, and an unexpectedly rich orebody in the west drift on the 15 level, '51' vein, helped greatly in maintaining tonnage and gold production. The profit during the quarter was sufficient to allow payment of the regular and extra dividends at the past rate. Future earnings and dividend rate will depend on the labor supply,

which as yet shows no improvement. Shortage of labor at your Takla Mercury mine has delayed the preparation for mining of richer ore found by drilling. The grade of ore treated has therefore been too low to maintain the expected production or to yield a consistent profit. The future will depend on the labor supply and on the continuance of the quicksilver purchase contract with U. S. Commercial Company."

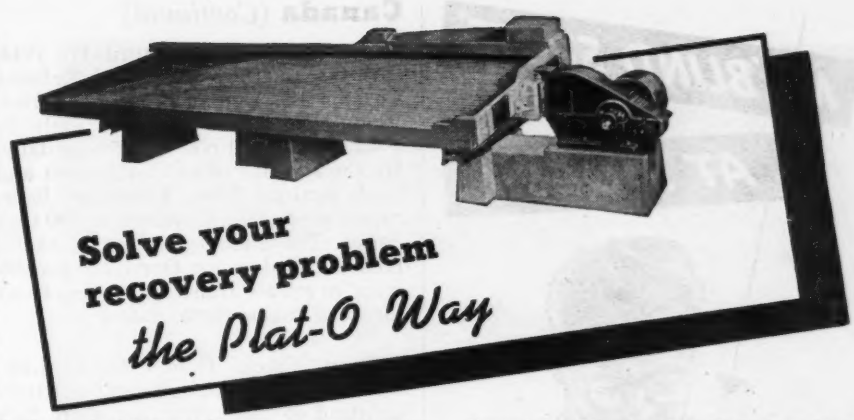
★In anticipation of the development of new orebodies by the current diamond-drilling program, directors of B. R. X. (1935) Consolidated Mines, Ltd., called an extraordinary meeting of shareholders for July 26 for the purpose of passing a resolution authorizing an increase in capital from $1,875,000 to $2,500,000. The increase is sought to provide sufficient funds to prepare the property for production.

★June production of The Cariboo Gold Quartz Mining Co., Ltd., was 961 oz. gold, valued at $36,998, from 2,648 tons, averaging 0.40 oz. gold per ton. Production for the first half of the calendar year 1944 was valued at $396,280, from 24,848 tons, averaging $15.94 per ton.

★Despite a material improvement in grade, the value of June production of Island Mountain Mines Co., Ltd., Cariboo mining division, was below that for May. Gold recovered in June was 796 oz., valued at $30,557, from 1,529 tons, averaging 0.52 oz. gold per ton.

★Hedley Mascot Gold Mines, Ltd., Osoyoos mining division, is sinking a series of short winzes on the Wheeler prospect, 2½ miles east of the Mascot fraction. Diamond-drill holes have indicated favorable mineralization, but a loss of sludge has made it difficult to determine values. The short holes are intended to obtain positive evidence as to the persistence, even at only shallow depths, of the surface enrichment.

★During the fiscal year ended Feb. 29, 1944, Kootenay Belle Gold Mines, Ltd., produced gold bullion valued at $49,678. After all operating expense and write-offs, net profit was $3,548. The Kootenay Belle gold mine, in the Nelson district, was closed during the year and much of the equipment transferred to the Whitewater mine, in the Slocan district. Net current assets at the close of the year was $91,930, compared with $279,199 a year earlier, the investment in Retallack Mines, Ltd., new lead-zinc producer, accounting for the reduction. By agreement with Whitewater Mines, Ltd., Kootenay Belle holds 150,000 shares of the 250,000 shares of Retallack, after paying Whitewater debts of $16,695 and equipping the Whitewater mine for production. In August last, H. Grattan Lynch, consulting engineer, estimated Whitewater reserves at 66,000 reasonably assured tons and 36,000 probable tons, averaging 1.0 oz. silver, 1.0 per cent lead, and 10.1 per cent zinc per ton. A contract for the sale of zinc concentrate was made Dec. 17th, 1943, with U. S. Commercial Co., and a further



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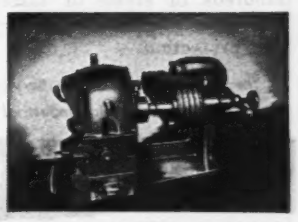

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Canada (*Continued*)

contract was effected April 17, 1944, with the American Smelting & Refining Co. for the sale of lead and silver. Production was commenced early in 1944 at an initial rate of 125 tons daily. By the addition of new equipment and used sections from Kootenay Belle, capacity has been increased to 300 tons daily. The annual meeting of shareholders called on the Dominion government to release Italian prisoners-of-war for work in base-metal mines.

★Sheep Creek Gold Mines, Ltd., Nelson district, paid its regular quarterly dividend of three cents per share July 15th to shareholders of record June 30th.

YUKON

★Yukon Consolidated Gold Corporation, Ltd., is currently operating three dredges, No. 7 on Quartz Creek, No. 4 on Bonanza Creek, and No. 3 in Bonanza Basin. Three crews are conducting stripping and thawing operations in other quarters. The value of production during May, first month of operation, was approximately $45,000. Operations were hampered to some extent by floods on the Yukon River, which necessitated a withdrawal of labor to maintain the supply of electrical power to the City of Dawson.

★The Canadian government has made plans for opening new mineral areas in the Yukon and adjacent districts along the Alaska Highway and the Canol pipe-line road. Surveying parties of the Mines and Geological Branch of the government will first search for new sources of petroleum, base metals, and strategic metals. Thirty-two surveying parties will be in the field in Canada this year, four of them in the Northwest. There also will be 14 topographical mapping crews, of which three will be in the Yukon and adjoining regions, mapping the Whitehorse and Dezadeach Lake areas of the Yukon. A detailed study of the area east of Great Bear Lake, where there are oil seepages, will be made and topographical investigations will be conducted in the MacKenzie River basins and in the Cameron Bay area east of Great Bear Lake.

★C. S. Lord, head of a party for the Canadian Geological Survey, reports prospecting opportunities in the district opened by the Alaska Highway between Watson Lake and Alaska. He says a small amount of preliminary prospecting was done there last summer, but that most of the district is virgin ground for hard-rock prospector and geologist. It is reasonable to expect important deposits of gold and base metals within easy distance of the Highway or its branches. Last summer he says the Survey made a reconnaissance of the area between Teslin and Watson Lake and found the Cassiar granite batholith. He estimates 20,000 sq.mi. of virgin ground in that district along both sides of the Highway that warrant prospecting.

MEXICO

Labor strike, ended about mid-July, was expensive for most mining companies

★Mining in Mexico was somewhat improved with the advent of midsummer. Labor conditions, a prime factor in the business in this country, were considerably better with the ending about mid-July of the general strike called on June 8 against some 140 companies and individual operators. The settlements were somewhat of a victory for the laborites, though they fell short of getting all they demanded—a 50 percent pay rise and a share in the profits. Most of the wage lifts granted were relatively small. But the employers had to pay high for wages during the strike, costs of the movement, and the funding of social services, such as consumption cooperative societies, medicine, and medical facilities.

Labor was generally satisfied with the settlements. But Juan Manuel Elizondo, secretary general of the national miners' union, was harshly criticized, when he appeared at a meeting in Monterrey, Nuevo Leon, of employees of the Fundidora de Fierro y Acero de Monterrey, Mexico's greatest iron and steel works, for what the workers considered "selling out" by the union chiefs. This company ended its strike on the basis of a daily increase of 60 centavos per employee, plus a daily bonus of 69 centavos for those who exceed their daily production quota; payment of 450,000 pesos as wages during the strike, which lasted for 24 days; 40,000 pesos to improve medical service and 4,000 pesos to establish a medical clinic. The men thought they should have had the 30-percent pay rise, to which they had receded from the 50-percent demand. However, work has been normalized in all the works' departments.

The Cia. Minera de Santa Maria del Oro, S.A., settled its strike by allowing a daily rise of 15 centavos (3.5 c.) per worker, paying 2,800 pesos as costs of the strike and providing 12,500 pesos to start a consumption cooperative. Moctezuma Copper, Nacozari, Sonora, settled with a daily pay rise of 50 centavos, retroactive from June 1, but with the stipulation that this will be cancelled if the market price of copper goes below 11.5 c. per pound, and to pay full wages during the strike, plus 35,000 pesos ($7,150) as its costs. Mexican Zinc and the Cia. Carbonifera de Sabinas, S.A., the latter a coal mining enterprise, both A.S.&R. units, operating in the Nueva Rosita zone, Coahuila made settlements identical to that of Moctezuma.

The Labor Ministry praised the conciliatory spirit of the mining employers and the miners union's chiefs and indicated that work in the industry should proceed harmoniously from now on. There is evidence that mining

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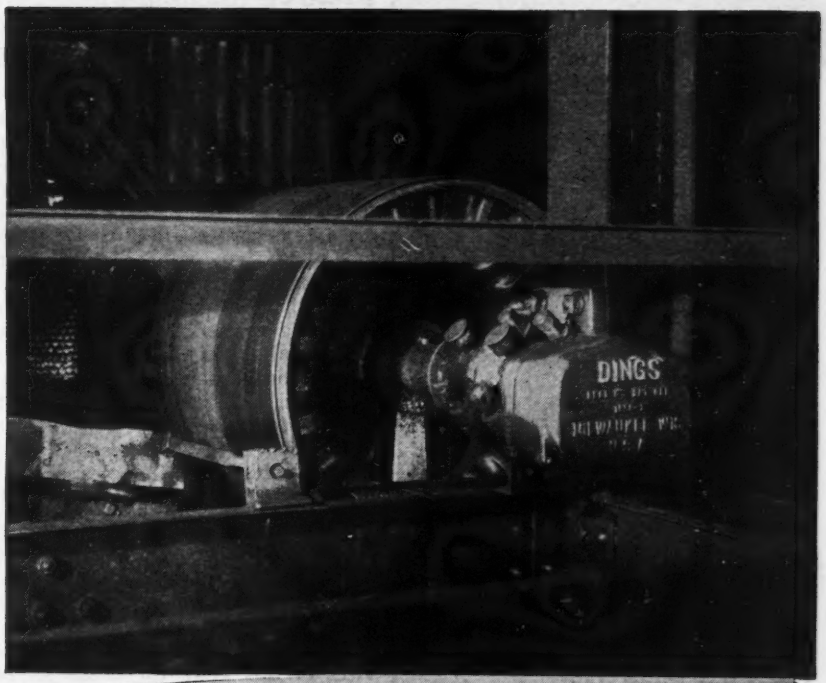

ACCOUNT NO.

SHEET NO. _____ NAME OPERATING EXPENSES

RATING CREDIT LIMIT ADDRESS MAGNETIC PULLEY

BUSINESS

DATE	ITEMS	FOLIO	DEBITS	CREDITS	BALANCE
1943					
Dec. 31	Depreciation (10 year basis)	J 365	154. 10		
	Electricity	CD 869	85. 54		
	Cash received for tramp iron recovered	CR 651		243.00	Cr. 3.36

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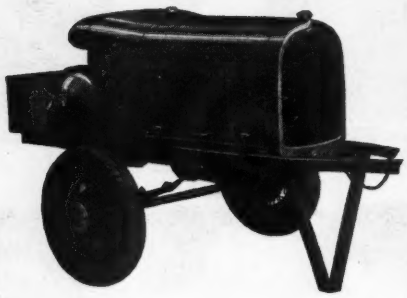

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Mexico (*Continued*)

labor has become convinced that the industry is not making the bonanza profits it thought it was.

★Cia. El Boleo, S.A., Santa Rosalia, Baja California, Auguste Nopper, general manager, a French-owned copper-mining company, has been granted a federal subsidy on its copper exports to the extent of a rebate of the 12 percent federal tax it pays on such shipments. This subsidy, it is explained, is to encourage the company to continue exporting copper and is to protect it against falling prices on foreign markets. The Union Nacional de la Industria de la Plata, the Mexican silversmiths' organization, which has its headquarters in Mexico City, has been allowed a federal subsidy of 78 pesos ($16) per net kilogram on its products that it exports.

★Aid for Guerrero mining in the form of better transportation facilities and more electric power has been asked of the federal government by the Mining Chamber of Mexico. Inadequate services of this kind, the Chamber said, have forced most Guerrero mining enterprises to reduce their work by 50 percent and several of them have suspended activities completely. The Chamber also complained of a sharp shortage of gasoline and fuel oil for the Guerrero mining companies. The Ministry of Communications and Public Works has been asked by Col. Rafael Catalan Calvo, Guerrero Governor, to order the government-operated National Railways to put more freight cars and locomotives in service on its Guerrero divisions for the benefit of mining.

★Mining in a considerable sector of the northwest is to have improved rail transportation facilities with the provision by the federal government of 350,000 pesos ($75,000) to recondition the rights-of-way and rolling stock of its Kansas City, Mexico, and Orient Railway. This line, which connects Chihuahua and Sonora and links up with American railroads at the border, was acquired by the Cardenas government some years ago and has been run by the Mexican administration ever since. Surveys have been completed for extending the railroad from Sonora to Topolabampo, a Sinaloa Pacific port. Grading and rail laying on this extension are expected to start soon.

★Contending that its economic condition is such that it cannot obey the federal law enacted Oct. 1, 1943, which makes obligatory the increase of pay of all contract workers in Mexico who earn up to 10 pesos ($2.10) a day, Kildun, San Luis Potosi, has asked the federal board of conciliation and arbitration to excuse it from granting these raises. Kildun invited the board to examine its books to verify its contention.

★Suits to upset the classification by the federal board of conciliation of the strike against them as legal, have been filed with the first district court, Mexico City, by San Franscisco Mines of Mexico, Cia. Minera Noche Buena y Anexas, S.A., Coahuila, and Cia. Minera Eureka, S.A., Nuevo Leon. San Francisco contends that the majority of its employees did not vote for the strike. The board asserts that they did, an action which made it automatically obligatory for it to classify the strike as legal. Noche Buena and Eureka told the court that they canot afford to meet their strikers' demands because there has been no increase in the market price of gold, silver, lead, and zinc, their principal products.

Peñoles has also asked the first district court, Mexico City, to set aside the board's ruling that the strike against it is legal. The company asserts that the strike was not favored by the majority of its employees.

Ending its strike was rather expensive for The Fresnillo Company, Fresnillo, Zacatecas. It granted a daily pay rise of 55 centavos (11.5 c.) per employee and paid 475,000 pesos ($96,500) to cover wages during the strike, costs of the strike, and for various social services for its 3,000 employees and their families. The wage increase is retroactive from June 8, when the strike started.

Peñoles later gave in and made an agreement with the miners union allowing a general daily pay rise of 50 centavos for its four units, two in Nuevo Leon and two in Coahuila, and payments of 300,000 pesos for wages during the strike, 20,000 pesos as costs of the movement, and 17,500 pesos to enable employees to found consumption cooperative societies, besides extending the work contract until 1946.

★Plans to enable Mexico's low-production and poorly paid mines, including mercury, to keep going with federal aid are being developed by the government. The program is to be put into effect by the Ministries of National Economy and Finance as soon as it has presidential approval. Employees of some of these mines have shown good will by cancelling demands upon their employers for pay increases, as they realize that the operators' economic condition does not permit paying higher wages. The plans call for these mines to continue working with present labor personnel and wage scales.

CHILE

Official figures show continued increase in copper production, but gold output declines

★William J. Turner retired recently as general manager of the Braden Copper Co. after 35 years' service in Chile. During his long sojourn in this country Mr. Turner saw this enterprise grow from a small producer in 1909 to one of the largest of the copper porphyries of the world. In more senses than one it can be said with justice that in each

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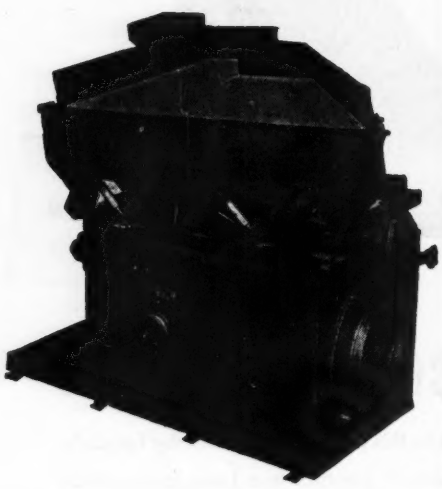

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Chile (*Continued*)

of the stages of this great growth and improvement, Mr. Turner left the mark of his ability, courage, energy. Moreover, he took a great interest in all matters pertaining to the progress and advancement of the country and in the welfare of the workers employed by the company.

His retirement was sincerely regretted in all circles in Chile and was the occasion for many farewell banquets where the people who had been associated with him for so long gave testimony of their high regard and friendship. Particularly touching were those of the town of Rancagua, where the municipality presented him with a gold medal suitably inscribed, and the luncheon given in the Santiago Union Club, where His Excellency the Chilean Secretary of State, Señor Fernández, presented him with the order "Al Mérito" in the grade of Gran Oficial." This was an unusual honor in Chile, rarely bestowed on a private individual.

★Though withheld from publication since Pearl Harbor, statistics of mine production are beginning to be published again. Figures show that the mining industry of Chile has been working at full capacity for the last three years and that peak production was reached in 1941. Taking 100 as the average figure for the boom years 1927–1929, the following index numbers of production, and dollar values, are obtained:

Year	*Index Number*	*U.S. Dollars*
1936	72.2	54,200,000
1937	100.3	99,500,000
1938	87.6	92,750,000
1939	87.1	98,800,000
1940	95.1	104,200,000
1941	109.2	123,100,000
1942	105.0	
1943	103.0	

Though these figures may not appear large in comparison with those of the United States, it must be borne in mind that Chile produces no oil, which, together with its byproducts, amounts to 40 per cent of the total value of the mineral production in the States; that the values in the years 1938–1941 are larger than the total budget of Chile in those years, and that in 1941 they represented 22.4 dollars per capita.

According to the official figures given in the recent presidential message to Congress, Chile's mineral production in the years 1942 and 1943 has been in the aggregate the largest in history. They have been condensed so as to make them more clearly understood at a glance in the accompanying table:

Commodity	1942	1943	Percent Increase or Decrease
Bar copper, met. tons			
Chile, Andes, & Braden	464,486	474,632	+2.0
Chagres & Naltagua	13,269	14,670	+1.0
Others	11,403	7,917	−30.0
Manganese ore, met. tons	32,000	52,000	+62.5
Crude sulphur, met. tons	34,000	33,000	−3.0
Sodium sulphate, met. tons	20,000	24,500	+22.0
Sodium Nitrate, met. tons	1,340,133	1,297,795	−3.1
Gold, kg.			
Metallic	2,200	1,600	−27.0
Ores and Concentrates	5,600	3,400	−40.0
Total	7,800	5,000	−36.0

The table showing production figures indicates clearly that the greatest over-all reduction took place in gold, followed by that of the small copper producers, whose output is in the form of relatively high-grade ores, about 12 percent. This is to be expected, since these producers are the least mechanized and bound to be most adversely affected by increased costs due to higher wages and supplies.

To show what a large share the mining industry represents in the total exports of Chile the following table has been computed:

Year	Value of Exported Mineral Products, US Dollars	Percentage of Exports to Total Mineral Production
1937	92.200,000	92.6
1938	72.600,000	78.4
1939	77.400,000	78.3
1940	75.400,000	72.1
1941	82.700,000	67.0

Figures in Chilean pesos have been reduced to dollars according to the present rate of commercial exchange of 31 pesos to the dollar. The official rate of exchange is 19.37 pesos to the dollar.

AUSTRALIA

Norseman Gold producing pyrite—Tungsten and tin deposits being developed in Tasmania

★Although South Kalgurli Consolidated is one of the smaller producers on the Golden Mile of the Kalgoorlie gold field, it is not the least interesting of the mines in that area. After surviving the great depression of 15 years ago, the ore reserve position has not been sufficiently good to warrant the erection of a new treatment plant embodying modern practice, but parts of the existing plant have been altered and modernized. The mine is the last in the State in which dry crushing and roasting of the ore, without preliminary concentration, is followed. Subsequent treatment is cyanidation as usually practiced, but filter presses, part of the original equipment, have been retained. Recovery has approximated 93 percent, rather better than that obtained by flotation, roasting, and cyanidation; but costs are higher. A variant of this standard practice, adopted by at least two mills, is precyanidation. Subsequent flotation, roasting, and treatment are the same in both methods. Each procedure has its own advocates. In South

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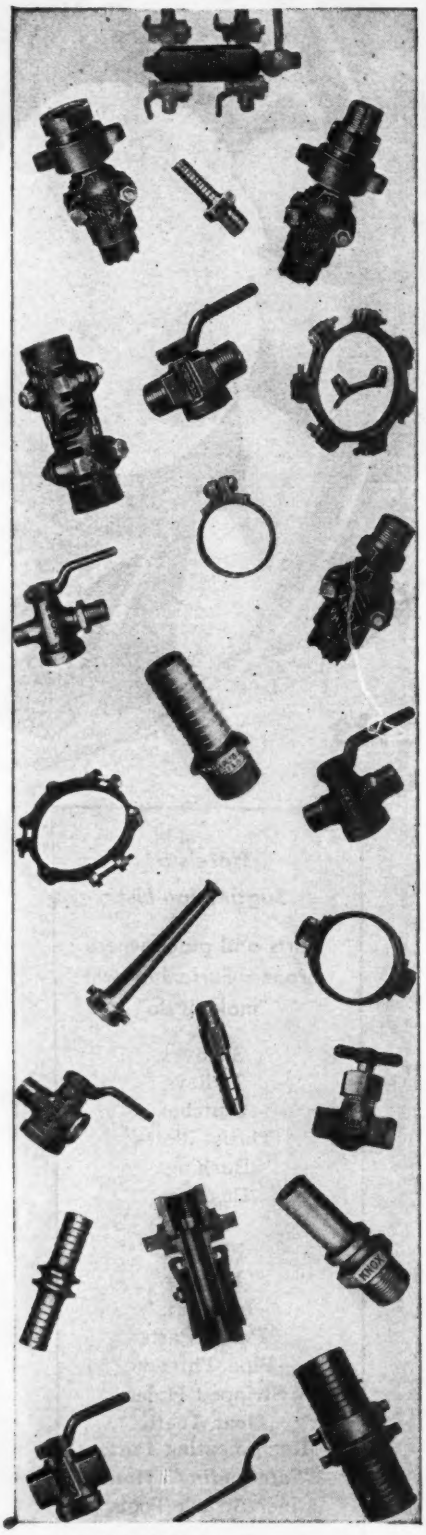

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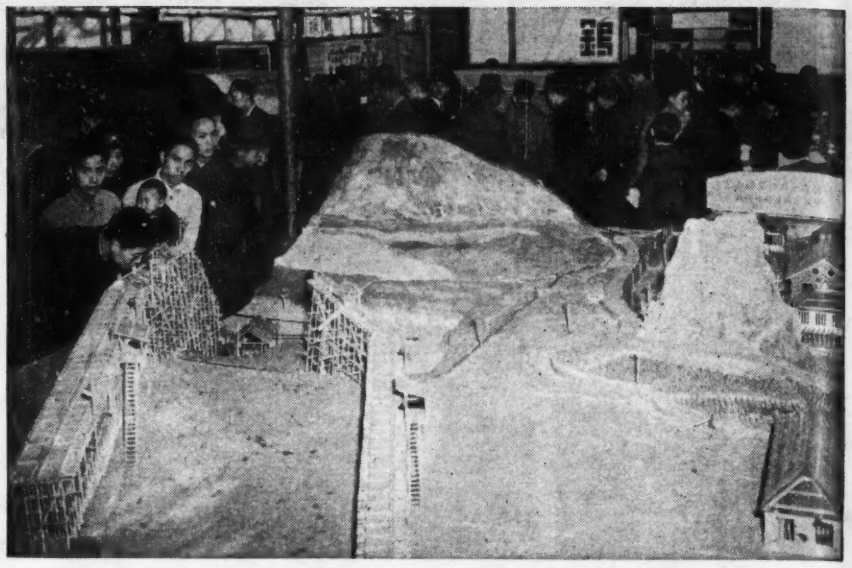

Model of a Chinese tin mine in the province of Yünnan, on view at an industrial and mining exhibition at Chungking, present seat of the Chinese government.

Australia (*Continued*)

Kalgurli's last reported year, to March 31, 1943, all operations were affected by shortage of labor. Ore treated amounted to 83,601 tons, compared with 115,560 tons in the previous year, a decrease of 27.7 percent. In the circumstances this is satisfactory, as it appeared likely during the period that the policy of the Commonwealth government would cause suspension of operations by the whole gold-mining industry. The average head value of the ore mined was 5.44 dwt. gold per ton. Develop work completed, 3,067 ft., was less than half that of the preceding year. Ore reserves were estimated at 210,200 tons of blocked-out ore assaying 4.97 dwt. per ton, and 123,800 tons of probable ore worth 4.98 dwt. per ton, a total of 333,800 tons. In view of existing conditions, and to make the best use of labor and local facilities, the company's mill was closed during the year, and ore is now being treated at the plant of Kalgurli Ore Treatment, Ltd., situated on the Boulder Perseverance mine, and at which ore from that company, North Kalgurli (1912), Ltd., and the Kalgoorlie Enterprise Gold Mines, Ltd., is also treated. Over-all costs were 42.6 s. sterling per ton treated.

★Norseman Gold Mines, N.L., which operates at Norseman, 160 miles south of Kalgoorlie, has transferred part of its activities from gold production to the mining of pyrite, which is railed to Perth for the manufacture of sulphuric acid. On the company's main, or Norseman, lease there is an extensive auriferous lode, which is being worked for a length exceeding 2,000 ft. On the neighboring Iron King lease is a wide, low-grade, gold-bearing formation, which was worked by open cut to a depth of 100 ft., and in association are lodes of more or less massive pyrite carrying low gold values. These heavily pyritic occurrences are being worked by underground mining methods. Much of the material as mined will assay 38 percent sulphur, and is consigned without treatment. The remainder is sent to a newly erected flotation section of the Norseman mill, and a concentrate assaying 44.5 percent sulphur is produced. The pyrite section of the company's operations has been opened and equipped for an output of 50,000 tons of ore per year. Ore reserves in the Norseman mine amount to 235,000 short tons having an average assay value of 4.0 dwt. gold per ton. The estimate for the Iron King section shows 333,000 tons with an average value of 2.2 dwt. per ton. An estimate of reserves of pyrite ore will not be prepared until the orebodies have been further developed. So far as the sulphide lode has been opened up, the length is 950 ft. with an average width of 15 ft. and a maximum width of 40 ft. Working costs of the Norseman mine, in Australian currency per ton were: Ore extraction, 21s. 4d.; treatment, 13s. 5175d.; total, 34s. 9.75d.

TASMANIA

★At the mine of King Island Scheelite, N.L., on King Island, the new treatment plant is nearing completion. Following the increased demand for tungsten caused by the war, the Commonwealth government advanced money to the company for the further proving of the large scheelite orebody, and as this work disclosed reserves of approximately 1,000,000 tons of ore of 0.8 percent WO_3, constituting what is probably the largest scheelite lode in the world, it was decided to increase the treatment capacity to 20,000 tons of ore per month. In the exploratory work two diamond drills were employed

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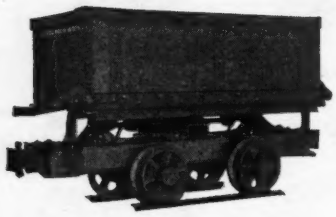

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Australia (*Continued*)

and 35 holes, aggregating 7,650 ft., were drilled. Further preparatory work has been in progress in the open cut to permit large-scale mining. During the year which closed on Oct. 31, 1943, 69,879 cu.yd. of overburden was removed by mechanical shovels down to the 170-ft. contour, the greatest amount of work being done at 155 ft. Milling ore, produced by the mechanical plant, amounted to 29,710 tons, from which 187.9 tons of scheelite concentrates were recovered. The plant, including power extensions and additional mining equipment, was estimated to cost £A260,000, of which the company was to provide £A45,000 and the Commonwealth government £A215,000 at an interest rate of 4 percent per annum. Until the expiration of the British contract for purchase of tungsten ores, the company is to be allowed to retain a net profit in any one year, after provision for taxation, of £A240,000. After the expiration of the contract the net profit will be apportioned between the company and the government pro rata to the amount of capital employed by the company and the amount owing to the government. Subject to an existing sales contract, the Commonwealth will purchase from the company the whole of the output of scheelite concentrates during the duration of the war and for six months after, at a fixed price. It has recently been advised that the completed cost of the new plant will approximate £A300,000.

★The Renison Bell tin field, on the West Coast of Tasmania, contains the largest tin-bearing sulphide lodes in the Commonwealth. The orebodies are not well developed, requiring much closer work for the delimitation of the occurrences of commercial grade and to permit the most efficient working of the lodes. There is undoubtedly a large tonnage of potential ore, and it is estimated by the operating company, Renison Associated Tin Mines, N.L., that ore reserves of a grade of 0.849 percent metallic tin total 750,000 tons, most of which is workable by open cut. In the past the deposits have been worked by small, under-capitalized companies which mined and treated the oxidized ore but were unable financially and technically to deal successfully with the problem of treating the sulphide ore. This ore consists of pyrrhotite, pyrite, and marcasite, with some silica. The lodes are of two types, more or less vertical, with widths from 5 ft. to 40 ft., and flat lodes with a width up to 140 ft. and a thickness of about 40 ft. In its last year's operations the company treated 10,095 tons of ore for the recovery of 92,25 tons of tin oxide concentrates. The mill is old and has been altered from time to time to improve the method of treatment. Extensive reconstruction is now proposed, and for this purpose the Commonwealth and State governments in conjunction have granted a loan of £A6,000. It is intended to replace the existing stamps with rolls to give cheaper crushing and to reduce the quantity of slime produced, which, on an ore in which the cassiterite is very fine, is a serious matter, for under present conditions recovery is under 60 percent. The reconstructed mill will also include ball mills instead of grinding pans. The present method of treatment, which will probably be followed, is reduction of the ore to a size at which the sulphide minerals, and also the cassiterite, will be freed. The ore is then floated for the removal of the sulphides and the tin oxide is concentrated on tables after classification. At present the mill is deficient in slime-saving appliances and it is at this stage that heavy losses occur. The company has carried out experimental work in the flotation of cassiterite, and it was reported that the recovery was satisfactory. But the usual difficulty which faces the treatment of fine material, that is the production of a final concentrate of commercial grade, proved insuperable with the mill as then equipped. Test work has since been carried out by metallurgists in the service of the Commonwealth and State governments, and it is reported that the work is to be carried out will improve recovery by about 10 percent.

NEW GUINEA

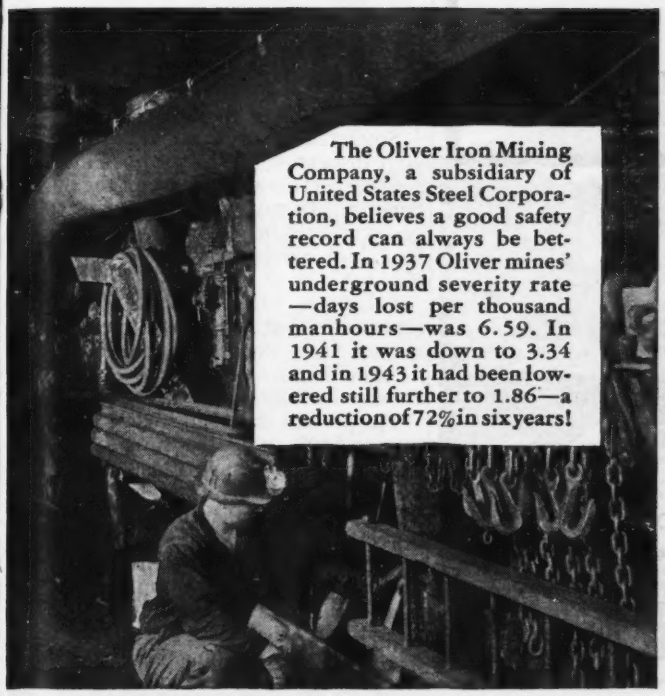
★Rehabilitation of buildings and equipment will be commenced as soon as practical by Bulolo Gold Dredging, Ltd. The company's advices are to the effect that the eight bucket dredges are intact, except for some small parts taken for military purposes. From the inception of operations until May 31, 1942, 119,072,100 cu. yd. of alluvium have been dredged for the recovery of 1,297,416 oz. of gold and 575,276 oz. of silver, an average of 5.25 gr. of fine gold per cubic yard. Reserves of dredging ground are estimated at 129,000,000 cu. yd., in addition to which there are 21,000,000 cu. yd. workable by hydraulic sluicing. The news regarding the dredges is satisfactory, for it was known that the buildings had been destroyed by Japanese bombing, as well as the storehouses and landing installations at the port. The company's fleet of transport planes was also destroyed.

Washington Reflections

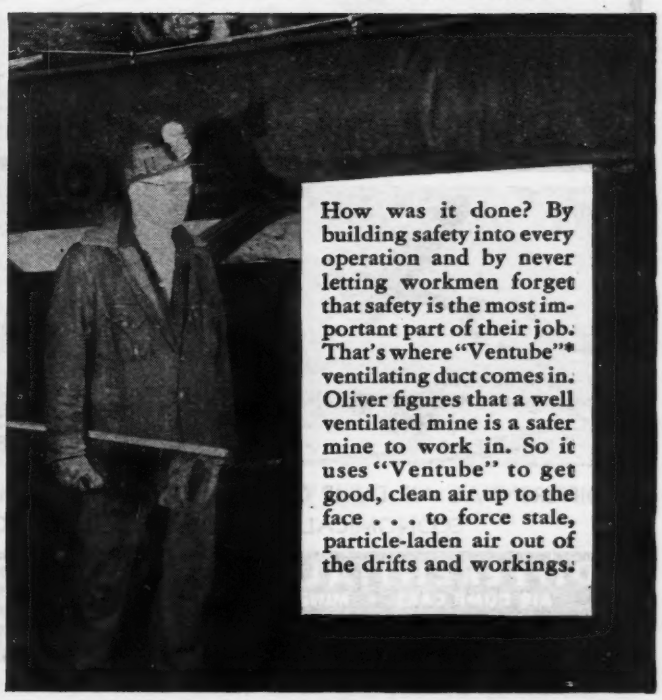
(*Continued from page* 103)

metal surpluses will involve the same balancing of considerations of market, Government cost, security, and national economic factors that is recommended for surpluses in general. After establishing stockpiles for security reasons in accordance with the recommendations of the military, the Administrator should, according to this view, work out with a mining industry advisory committee a program for the periodic sale of metal surpluses that will permit metal producers to gage the market and continue fair production of new metal without interruption."

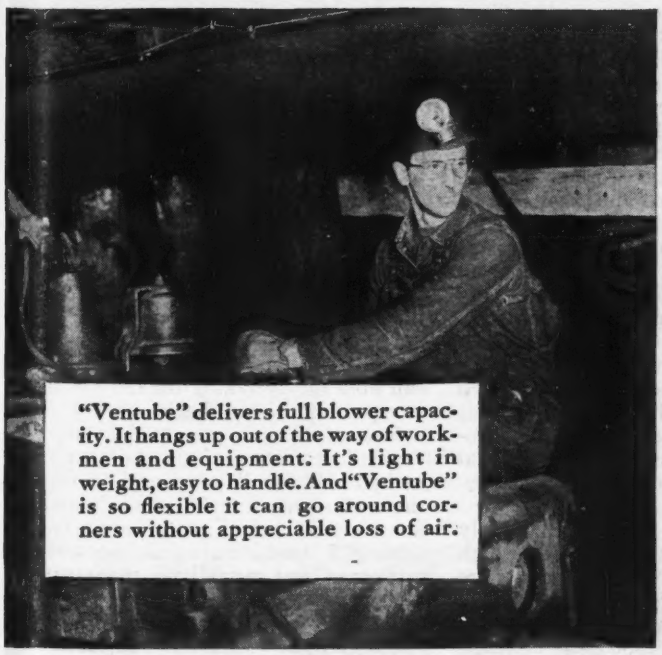
How to make Your Safety Program Complete



The Oliver Iron Mining Company, a subsidiary of United States Steel Corporation, believes a good safety record can always be bettered. In 1937 Oliver mines' underground severity rate—days lost per thousand manhours—was 6.59. In 1941 it was down to 3.34 and in 1943 it had been lowered still further to 1.86—a reduction of 72% in six years!



How was it done? By building safety into every operation and by never letting workmen forget that safety is the most important part of their job. That's where "Ventube"* ventilating duct comes in. Oliver figures that a well ventilated mine is a safer mine to work in. So it uses "Ventube" to get good, clean air up to the face . . . to force stale, particle-laden air out of the drifts and workings.



"Ventube" delivers full blower capacity. It hangs up out of the way of workmen and equipment. It's light in weight, easy to handle. And "Ventube" is so flexible it can go around corners without appreciable loss of air.

Du Pont also makes a compact, roomy powder bag from same material as "Ventube." It's impregnated and coated with composition that won't peel off. Write for prices, sizes, additional information.

*"Ventube" is Du Pont's registered trade mark for its flexible, rubberized ventilating duct.

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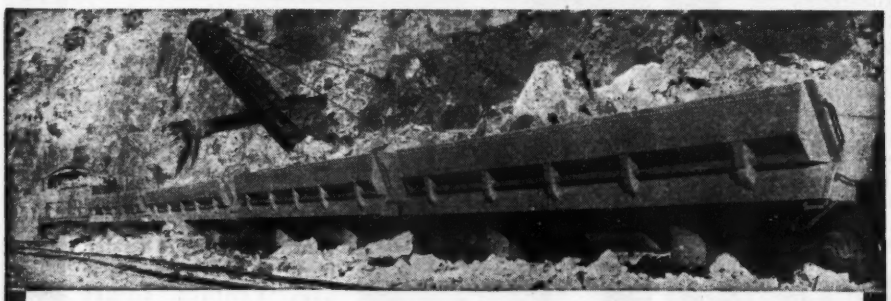

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FINDLAY, OHIO

LETTERS (*Continued*)

to approximately red heat or higher. . . .

" . . . if the final calcining temperature be high enough, the exterior surface of the briquette may have a glazed appearance."

In the early twenties, we made several carloads of pillow-shaped briquettes of phosphate fines in the briquetting plant of the M. A. Hanna Company, Buffalo, New York.

This plant was being used for briquetting blast-furnace flue dust and since we sandwiched our test operations in between the regular runs on their blast-furnace flue dust, our phosphate briquettes become contaminated or mixed with 2% to 3% of this flue dust. The binder used was pitch.

The briquettes were tried out in the ferrophosphorus blast furnace at Rockdale, Tennessee, in place of lump phosphate rock. The metallurgical results were the same as with lump phosphate rock, except that the furnace drove about 15 per cent higher than on lump phosphate rock. This we attributed to the velocity of the charge and the fact that the presence of coke-bearing flue dust in the phosphate briquette accelerated the reduction.

Shortly after the above test, we made about 120 tons of phosphate briquettes which was calcined according to U.S. Patent 1,655,981. These briquettes were very firm and waterproof, and could stand any ordinary handling; they were shipped to the Swan Chemical Company, Anniston, Alabama, and used commercially in the electric furnace for the manufacture of phosphorus and phosphoric acid. The operation was quite successful with the exception that the briquette charge worked a little too well, and reduced and smelted at a lower temperature; and drove faster than when lump phosphate rock was used. This caused some trouble from bridging, but this could have been easily corrected by altering furnace conditions or the composition of the briquette.

The furnace used in calcining or surface sintering the above mentioned briquettes is described in U.S. Patent 1,573,533, granted to the writer in February 1926 (assigned to International Agricultural Corporation), briefly described as follows:

The furnace is a shaft of relatively narrow transverse section down which briquettes are fed, while hot gases are inducted across through the relatively narrow column of briquettes.

In the December 1936 issue of Engineering and Mining Journal, title "An Advance in Zinc Smelting," we noted the description of a vertical furnace in the plant of the New Jersey Zinc Company which is apparently identical with my furnace noted in the above patent.

During the period of the tests mentioned, we also did a great deal of research and pilot-plant work on nodulizing and sintering, and it was our conclusion at the time that briquetting offers certain advantages which should be considered when agglomeration is indicated and should find increasing use as beneficiation of low-grade ores becomes more profitable or mandatory.

JAMES A. BARR.
Chief Engineer,
International Minerals & Chemical Corporation
Chicago, Ill.

Seamy Side of Present Claim-Holding Practices

The Editor:

SOME TIME AGO I READ WITH INTEREST your discussion on the subject of licensing prospectors and miners on the public domain. In my opinion any licensing system would be detrimental to mining. In Ickes' hands it would be a major disaster.

I believe, after some thirty years experience, that a change in the existing mining laws would be beneficial, but it should not be done by creating another socialistic bureau.

The present law requires the expenditure of $100 annually, which is wholly inadequate to insure honest development, particularly when such money may be spent on trails, shacks, etc.; thus, thousands of claims are held year after year without any attempt at actual development. Any claim owner who is unwilling to do the equivalent of at least 100 ft. of drifting per year has no intention of developing his claim, and certainly anything less will not produce results. I have known many propectors who have done much more and either proved up a prospect of value or moved on.

Today we see thousands of claims held by persons who are neither prospectors or miners and who do not intend to spend any money on genuine development; they live in the hope of getting a first payment out of some sucker, they are not interested in the development of the mine, they don't care if you throw it up, they hope you do; then they expect to get another first payment out of another sucker; so why do any development work when they can hold on by raking off the old trail or repairing the old shack.

Recently a man presented to me his "mine" consisting of six claims which he had held for 35 years and on which there was only one 50-ft. shaft and a few "gopher holes"; after some questioning I found out that he was a cattleman and put all his money into the improvement of his ranch—but he expected to get a large first payment.

I would like to see this subject thoroughly discussed in the E. & M. J. as the future of mining depends on honest development. So long as the public domain is plastered with unworked mining claims, just so long will many potential mines remain unproductive; get rid of the parasites and open the country up to the real prospector.

BERNARD P. MILLER.
San Francisco, Calif.

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EQUIPMENT NEWS

High-Frequency Generators For Induction Heating

For induction, as well as dielectric, heating loads, a complete line of high-frequency generators with ratings of 1-, 2-, 5-, 10- and 20-kw. in line with NEMA standards has been introduced by Westinghouse Electric & Manufacturing Co. Completely self-contained, the units require only electrical connection to a 60-cycle power supply and have no external cooling or other auxiliaries. Units of 50- to 200-kw. capacity can be supplied in addition to standard 1- to 20-kw. ratings. Primary voltage is 220 or 440, single phase for ratings of 5 kw. or lower and three phase for 10 kw. and higher. Housed in the single cabinet are the oscillator, power supply, blower, and necessary switchgear. The high-frequency section is completely shielded to minimize possibility of interference with nearby communication circuits. Automatic timing control permits load-cycle adjustment to a predetermined time, which can be automatically repeated. Terminals are provided for remote control. Air-cooled tubes are used in the standardized generators.

Generators are available for frequencies of 450 kc., 5, 15, and 30 mc. for ratings through 10 kw. and 450 kc., 2 and 10 mc. for 20 kw. and higher. This range of frequencies provides for adequate handling of all tvpes of induction problems.

Single-phase, full-wave mercury-vapor rectifiers provide the anode current for generators under 10 kw. For larger ones, a three-phase, full-wave rectifier, utilizing six mercury-vapor tubes, is used. Time-delay switches are standard on all rectifiers. Step starters are used in the 20-kw. capacity unit and those larger to safeguard the rectifier tubes.

Reverse Flow Damper For Bypass Control

The new Heacon damper recently introduced by the Thermix Engineering Co., Greenwich, Conn., employs two curtains for regulating gas flow in either direction. The curtains are tied together mechanically so as to operate simultaneously. This permits flow in either direction regardless of the damper position.

With a damper of this type in a natural draft bypass around fans, or in a heat- or dust-regulator installation, many of the evils normally encountered are eliminated. It provides complete isolation of the equipment for maintenance purposes. Elimination of recirculation gives increased capacity and heat absorption, thereby reducing the

maintenance of equipment under control. Banking losses are reduced and accurate regulation of natural draft is obtained. This damper, type DVHR, can also be successfully used in cross-over air ducts between forced draft fans.

INDUSTRIAL NOTES

Edmund H. Lunken, chairman of the board of The Lukenheimer Co., Cincinnati, Ohio, died on July 19.

Chester H. Butterfield, vice president in charge of sales of **Manning, Maxwell & Moore, Inc.,** Bridgeport, Conn., announces that **Albert W. Coleman** has been appointed sales manager. The newly created position was made to meet the accumulated changed conditions and postwar plans of the manufacturer of Ashcroft gages, Hancock valves, American industrial instruments, and Consolidated safety and safety relief valves.

Lt. Col. C. B. Laird, for years sales manager of the **Eagle Iron Works,** Des Moines, Iowa, will resume his duties with the company at once after three and one half years with the Mechanized Cavalry, **Theodore Aulmann,** president, has announced.

Whiting Corporation, Harvey, Ill., announces appointment of the **Cardinal Supply & Mfg. Co.,** 427 Sunderland Bldg., Omaha, Neb., as its exclusive sales representative in the Omaha territory (Nebraska and Western Iowa). The Cardinal Co. will handle Whiting cranes among other lines.

General Electric Co. has announced that it has a new two-part, all-color sound movie, "The Story of A-C Welding," which is expected to increase materially the already large number of users of the alternating-current, arc-welding process. This 16-mm. movie has been made available to all G-E arc-welding specialists and distributors, who will arrange to exhibit it on request. About 35 minutes is required to show it.

American Optical Company, Southbridge, Mass., has a new program for reemployment of war veterans, developed in cooperation with the Apprentice Training Services of the War Manpower Commission for use as a pattern to be followed in veteran training and rehabilitation. This company has sent more than 3,000 former employees into the service.

Edgar H. Bristol, president of **The Foxboro Co.,** of Foxboro, Mass., and one of its founders, died unexpectedly of a heart attack, on July 24, at his summer home at Falmouth Heights, Mass.

"One American Business," published by the **Hyster Co.,** Portland, Ore., and Peoria, Ill., is the title of a 143-page book that features, largely in pictures, the company's personnel. This is issued as a way of expressing appreciation publicly of the wartime production job done by the employees. The book is prefaced by a 13-page history of the company. At the end is a 20-page pictorial presentation of Hyster products photographed on the job.

BULLETINS

Lubricator. Rucker Equipment Co., 300 17th St., Oakland 12, Calif., has issued a bulletin on the Arnold lubricator for pneumatic tools. It is described in another column.

Eutectic Welding Alloys Co., 40 Worth St., New York, has issued a bulletin covering two repair jobs on electric motors using the company's welding alloys and fluxes. The substance of two prize-winning articles appearing in the company's own magazine is given.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has issued a new quick-picture bulletin (B6331) in which five special kinds of Texrope V-belts—each designed for a specific type of protection—are reviewed. The heat-resisting Super-7 is a standard Texrope belt made of Buna-S which can operate easily at 180 deg.-F. ambient temperatures. Oil-resisting Super-7 is a regular Texrope Buna-S belt core protected by a Neoprene rubber synthetic covering. Oil-proof Super-7 belt is made of solid Neoprene, designed to withstand heavy-duty oil conditions. To ground electric charges, static-resisting Super-7 conducts the charges through its cover section to motor or machine. The Super-7-Steel belt, the newest, is built particularly to withstand high speeds with much less stretch than conventional-type belts. Allis-Chalmers is credited with the invention of the multiple V-belt drive. The company's new type Magic-Grip sheave and the four-speed changing methods used in its sheaves are also described. In another bulletin (B6340) a new line of smooth-flowing arc-welding electrodes with quiet arc characteristics is announced. These electrodes, both a-c and d-c types, use the standard American Welding Society number and color, simplifying selection and handling.

Cooling Towers. The Marley Co., Inc., Kansas City, Kans., has issued Bulletin 700-A, describing its double-flow horizontal induced-draft cooling towers, with illustrations of typical installation in the mining industry and elsewhere. Pp. 34.

Welding. Progressive Welder Co., 3050 E Outer Drive, Detroit 12, Mich., has prepared a 12-page booklet entitled "The Why and How of Storage Battery Welding."